Auditing for good: dairying, environmental auditing and the 'good farmer' in the Amuri Environmental Collective

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Abstract of a thesis submitted in partial fulfilment of the requirements for the Degree of Master of Natural Resource Mangement and Ecological Engineering.

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Canterbury is one of New Zealand's main regions for dairy production and has undergone considerable intensification in recent times, with increased areas of irrigated land, stocking rates and inputs. Key concerns surrounding the intensification of farming practices include declining flow rates in water bodies and the deterioration of water quality. In the Hurunui-Waiau region the Amuri Irrigation Company (AIC) has registered a voluntary collective scheme, which became operative in December 2014. Under the scheme, each farm is audited based on an individual Farm Environment Plan, which sets out specific targets that need to be met. If a farmer owns multiple farms, each farm is audited separately. Individual audits for each farm are carried out by AIC and grades from A to D are awarded based on the environmental performance. Since the introduction of this scheme there has been an improvement in auditing grades, indicating a change in environmental management practices implemented by the farmers under the scheme. There has also been increasing public and regulatory pressure on farmers to mitigate negative environmental impacts from agricultural production. This research investigates whether the shift in management practices to meet the audit criteria is associated with a change in farmers' identity and, more specifically, how they define being a 'good farmer'. Twelve farmers and five stakeholders were interviewed and their responses indicated that there has been a significant increase in environmental awareness within the farming community since the environmental collective started, which has led to a shift in farmer identity and how farmers define what it is to be a good farmer.

Keywords: Dairy farming, environmental management systems, 'good farmer' concept, farmer identity, Amuri Irrigation Company, Farm Environment Plans, intensificaiton, water quality.

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Abbreviations

AIC - Amuri Irrigation Company

CRC - Canterbury Regional Council

CWMS - Canterbury Water Management Strategy

ECAN - Environment Canterbury

EMS - Environmental Management System

FEP - Farm Environment Plan

GMP - Good Management Practice

HDLG - Hurunui District Landcare Group

HWP - Hurunui Water Project

HWRRP - Hurunui Waiau River Regional Plan

HWZC - Hurunui Waiau Zone Committee

ISMP - Amuri Irrigation Scheme Management Plan

LWRP - Land and Water Regional Plan

NPSFM - National Policy Statement for Freshwater Management

P/PP/MF - Productivist/ post-productivist/ multifunctional

RMA - Resource Management Act

WCO - Water Conservation Order

ZIP - Zone Implementation Plan

Chapter 1

Introduction

Agricultural production in the 21st century is faced with the twin challenges of needing to produce more (to meet demands from population growth), while addressing environmental limitations that impede production (Misselhorn et al., 2012). In order to meet increasing demand, farmers need to produce more food with a lower availability of resources, particularly due to increasing restrictions on availability of freshwater and fertile land (Altieri & Nicholls, 2017). It has been shown in recent studies that the current trends in yield improvement are insufficient to meet the global food demand that has been projected for 2050, thus requiring the further expansion of agricultural land (Bajželj et al., 2014). The United Nations' Food and Agriculture Organisation (FAO) has estimated that pasture-based food production will increase by 60% come 2050 (Alexandratos & Bruinsma, 2012). However, expanding agricultural areas is undesirable due to the consequent loss in biodiversity and contribution to climate change and pollution, particularly of air and water (Bajželj et al., 2014). The negative environmental externalities from agriculture also include soil erosion, reduced pollination services, reduced carbon sequestration rates and human livelihood effects (Zhang, Ricketts, Kremen, Carney, & Swinton, 2007).

In response to this challenge, researchers are focusing on a range of potential solutions such as agroecology, technological innovation and the use of sustainable intensification, which involves increasing crop yield while simultaneously improving irrigation, fertiliser and pesticide use efficiency as an alternative to agricultural expansion (Bajželj et al., 2014; Garnett et al., 2013; Godfray et al., 2010). There is also growing awareness that to meet the food needs of a growing global population, the solution may not simply require increased production of food, but also a focus on reducing food wastage (Aschemann-Witzel et al., 2017; Principato, 2018). An estimated 1.6 gigatonnes of food is wasted every year, which accounts for approximately 27% of total global agricultural production for both food and non-food uses (De Clercq, Wen, Gottfried, Schmidt, & Fei, 2017).

Consumers and communities around the world are also becoming increasingly concerned about the environmental and social impacts of agriculture (Cullen, Hughey, & Kerr, 2006). Consumer awareness surrounding the lack of environmental protection and social equity has led to a growing expectation that food products are produced sustainably (Cherian & Jacob, 2012). This has stemmed from the increased accessibility of sustainable lifestyle choices, which are becoming more attractive and expected (Ottman, 2017). Communities, particularly in rural areas, are also demanding that

business operations do not negatively impact on natural resources (particularly water quality) (Carruthers, 2011). In response to the increase in environmental consciousness of consumers, many organisations have acknowledged the need to "go green" by adopting the concept of corporate environmentalism (Cherian & Jacob, 2012). For New Zealand, there are also additional incentives to maintain the clean green, '100% Pure' image as this provides the driving force behind the tourism industry, which is the second largest contributor to the country's export earnings following agriculture (Tsui, Balli, Tan, Lau, & Hasan, 2018, pp. 205-206).

In 2017, New Zealand's dairy sector accounted for 3.5% of the total GDP, which equated to $7.8 billion (Ballingall & Pambudi, 2017). Canterbury has become one of New Zealand's main regions for dairy production, with an estimated density of 29 cows per km^2 (Statistics New Zealand, 2017). As shown in Figure 1-1 below, Canterbury and Southland have had the most significant increases in dairy cattle numbers between 1994 and 2015.

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Figure 1-1 Map showing dairy cattle percentage change in counts from 1994 to 2015 (Statistics New Zealand, 2018)

In response to the profitability of dairy farming, large numbers of dryland farms have been converted to irrigation to maintain pasture for dairying. This had led to an increase in demand for water in Canterbury (Jenkins, 2017). Whilst there are significant monetary rewards, dairy intensification requires higher levels of external inputs to allow farmers to increase stocking rates and production rates (Foote, Joy, & Death, 2015). This increase in farming intensification has not been without backlash, with the dairy industry receiving widespread criticism from the public,

particularly in regard to the negative environmental impacts such as nitrate contamination of groundwater and surface water (Baskaran, Cullen, & Colombo, 2009; Jenkins, 2018c).

The abundance of freshwater from rivers and groundwater has facilitated that rapid growth of irrigation in Canterbury, which now accounts for 70 per cent of all irrigated land in New Zealand (Canterbury Water Management Strategy, 2010). The region has the greatest allocation of water in the country, but it also has the highest Potential Evapotranspiration Deficit (the amount of additional water needed to maintain pasture growth at the potential seasonal rate) and therefore has the highest dependency on water (Jenkins, 2018c). The river systems in Canterbury can be categorised into three main types: snow-fed alpine rivers with peak summer flows; foothill rivers with rain-fed catchment areas and peak winter flows; and lowland streams that rely on groundwater supplies (Jenkins, 2018c). There are seven alpine rivers in the region (Waitaki, Rakaia, Waimakariri, Waiau, Rangitata, Hurunui and Clarence) and these contribute to 88% of the annual average river flow (Jenkins, 2018c). Pressure on water resources is more severe for foothill rivers and lowland streams than alpine rivers (Morgan, Bidwell, Bright, McIndoe, & Robb, 2002). The aquatic ecological systems in Canterbury are sensitive to flow variability and low flows, which makes them highly vulnerable to intensive agricultural practices that rely on abstraction of surface and groundwater (Jenkins, 2018c). In order to preserve the environmental values of Canterbury rivers, the following flow types need to be protected:

- "Low flows - there is a need for restrictions on out-of-stream withdrawals so that there is not an increased frequency of low flows below the minimum flow to support instream values;
- Flushing flows - there needs to be sufficient "flushing flows" (typically about three times the mean flow to dislodge algae and prevent build-up of algae;
- Flood flows - there needs to be sufficient flood flows (greater than the one-in-one-year maximum flow) to ensure turnover of gravel in the river bed in order to maintain the braided character of major rivers" (Jenkins, 2018c, p. 41).

When water availability is uncertain, farmers tend to over apply water 'just in case' in times where water is available even if it is not necessarily required for crop growth, instead of applying at the right time according to crop requirements (Jenkins, 2013b). Farmers with a reliable water supply are able to make more efficient use of irrigation water, for example a study found that when comparing farms with and without storage, the farms with storage capability had soil moisture levels that were below 50% field capacity for 4 out of 35 weeks, whereas the farms without storage were below 50% field capacity for 10 out of 35 weeks (Jenkins, 2013b).

According to Blackstock, Ingram, Burton, Brown, & Slee (2010), to engage farmers in the process of improving water quality through changing land management, it is fundamental to first gain agreement on whether there is a water quality problem and if it is linked to aspects of current farm management practices. An example of this is the Pahau enhancement group in the Hurunui-Waiau catchment, that was formed by a group of farmers after they observed green slime flowing in the Pahau River, and recognised that this was a result of run-off from border dyke irrigation.

In recognition of negative environmental externalities, some farmers and land owners have adopted environmental management systems (EMS), which allow them to identify and alter the management practices that need to be adjusted to reduce negative environmental outputs. In doing so, farmers can show consumers and the wider community that the environmental sustainability of their farming practices is improving (Carruthers, 2011). An EMS customised for farmers in the Hurunui-Waiau region has been developed and adopted by the Amuri Irrigation Company (AIC).

The Amuri Irrigation Scheme Management Plan (ISMP) is the guiding document for the environmental collective that was established by AIC in the Hurunui-Waiau region. A key component of the ISMP is the EMS, which sets the overarching protocols, policies and procedures for the improvement of farm environmental management practices. During the development phase of the ISMP, AIC consulted with the Hurunui Waiau Water Zone Committee, Environment Canterbury (ECAN), land managers in the catchment and relevant industry organisations (such as Irrigation NZ and Fish and Game) (Rutherford, 2017). The Hurunui Waiau Zone Committee (HWZC) is a joint committee that was established by the Hurunui District Council and ECAN, with the purpose of working with the community to develop an action plan to meet the requirements of the Canterbury Water Management Strategy (CWMS) (A. Rutherford, personal communication, March 9, 2018). The ISMP sets out the following overall goals and objectives for the scheme:

1. Improve/maintain water quality standards;

2. Improve nutrient management to allow for new irrigation development;

3. Develop a sustainable best practice audited self-management programme for water quality;

4. Maintain and enhance economic productivity while preserving environmental and cultural integrity of natural resources (Rutherford, 2017).

The collective scheme became operative in December 2014 and there are currently 160 shareholders and 32 private, non-AIC shareholders signed up to the scheme (Rutherford, 2017). For non-shareholder members of the AIC Environmental Collective there is a different membership

agreement as they are not entitled to AIC water or to share in AIC's nutrient load or consents. Instead, they "sign a separate membership agreement limiting membership to enabling members to meet the requirements of Rule 10.1[1] on condition they pay a membership fee and adhere to the requirements of the Collective set out in the Irrigation Scheme Management Plan" (A. Rutherford, personal communication, 10 May, 2018). The number of non-shareholder members has grown since the establishment of the AIC Environmental Collective to now represent around 30% of the scheme, and non-shareholder Farm Environment Plans (FEP) cover approximately 28 000 hectares of farmland, whereas shareholder farms cover just over 56 000 hectares (A. Rutherford, personal communication, 10 May, 2018).

This research will focus on the AIC Environmental Collective farmers (both shareholder and non-shareholder), with the aim of identifying the main drivers behind any shift in farm management practices towards good management practice (GMP). The study will also investigate, based on the 'good farmer' concept, if there has been a shift in how farmers define the identity of a good farmer as a result of the change in management practices. A series of 17 semi-structured interviews were conducted with farmers and stakeholders to determine if there has been a shift in identity. The main theoretical framework that was used to analyse the interviews is the productivist/post-productivist/ multifunctional model of agricultural change (P/PP/MF) (Burton & Wilson, 2006), which is based on identity theory and Giddens' (1991) theory of structuration as well as the spectrum of multifunctionality (Wilson, 2008). It was found that almost all farmers fell under the multifunctional category, but at different stages along the multifunctional spectrum. This was due to an increase in environmental expectations in the new AIC regulatory framework and an increase in environmental awareness in the farming community. For the majority of farmers, conservationist thoughts and actions have become part of the definition of what it is to be a 'good farmer' and this has been a driver for continued shifts in environmental practices.

[1] Refers to Rule 10.1 of the Hurunui Waiau River Regional Plan, which is explained on page 24.

Chapter 2

Literature Review

2.1 Introduction

The first four sections of the literature review provide the context for the study, outlining the regulatory, environmental and institutional factors and the social context. These sections cover the history of freshwater management in the Hurunui-Waiau zone, the political tensions within the catchment as well as the structure and guiding principles of the Amuri Environmental Collective and the auditing process. The final section is focused on the theoretical frameworks that will be used to frame the results and discussion sections. These include Giddens' Theory of Structuration, identity theory, the P/PP/MF model and the spectrum of multifunctionality.

2.2 Regulatory factors

2.2.1 Freshwater Management Policy

In acknowledgement of the flow-on effects of agricultural intensification, the New Zealand Government developed the National Policy Statement for Freshwater Management (NPSFM) in 2011, which provides guidance for local authorities to establish 'bottom lines' for water quality standards around the country (Taylor & Mackay, 2016). Some of the key concerns surrounding the intensification of farming practices include declining flow rates in water bodies, nutrient pollution of surface and groundwater, loss of native biodiversity, damage to soil structure and increased discharge of greenhouse gases (Baskaran et al., 2009; Carruthers, 2011; Parliamentary Commissioner for the Environment, 2004). In Canterbury, leaching rates on irrigated dairy farms are much higher than on other land use types and have been recorded at levels as high as 180 kg N/ha/y, which has negative impacts on water quality (Lilburne, Webb, Ford, & Bidwell, 2010). Tait & Cullen (2006) determined that the annual external costs of dairy farming in Canterbury ranged from $196.59 to $308.23 per hectare based on the following four categories of impacts: damage to water resources, damage to air resources, damage to ecosystem biodiversity and damage to human health. In order to respond to some of these issues and ensure compliance with the Resource Management Act 1991 (RMA) and the NPSFM 2011, the Canterbury Land and Water Regional Plan (LWRP) was developed. The LWRP recognises the need for an integrated approach as "competing demands for water, issues arising from interconnected land and water resources, effects of land use, and hazards arising from natural and human-induced processes all point to the need for integrated and consistent management" (Environment Canterbury, 2017, p. 9).

Prior to the implementation of the NPSFM, the CWMS was developed between 2004 and 2010 as a key partnership between ECAN, Ngāi Tahu, Canterbury's district councils and relevant stakeholders to set goals and objectives for water quantity and quality at the sub-regional level (Duncan, 2014a; Environment Canterbury, 2013). This was in response to the failure of the RMA processes to "generate sustainable management solutions to water management issues in the region" (Jenkins, 2013c, p. 1). The RMA was designed to manage the adverse effects for individual applications and "there are shortcomings in the legislative framework for the management of cumulative effects, such as the impact of groundwater withdrawals from Canterbury plains aquifers on the flows in spring-fed lowland streams (Jenkins, 2018c, p. 42). In 2010, the central government removed the elected councillors from the Canterbury Regional Council (CRC) (Creech, Jenkins, Hill, & Low, 2010) and replaced them with temporary comissioners due to stalled irrigation expansion and sub-standard performance in processing water consent applications (Duncan, 2016). This was a highly controversial move as people viewed this as being highly undemocratic and questioned the motives of central government involving themselves so assertively. People also raised concerns around environmental protection if decisions were to be pushed through more quickly. Following this change, the CWMS "has become the driving force behind what is promoted as a new paradigm of governance in the region with its collaborative approach to water planning and management" (Duncan, 2014b, p. 18). The CWMS follows a nested goverance system, with a Regional Committee that is responsible for recommending programmes related to regional issues such as water distribution and storage and ten Zone Committees that are responsible for subregional issues such as improving water quality through adjusting land-use practices (Jenkins, 2018b).

The purpose of the CWMS is to "enable present and future generations to gain the greatest social, economic, recreational and cultural benefits from our water resources within an environmentally sustainable framework" (Canterbury Water Management Strategy, 2010, p. 6). The CWMS states that there is capacity for further development within the region, but this is dependent on existing users and new users shifting to good management practices or best management practices (Canterbury Water Management Strategy, 2010; Duncan, 2014b). For this to be achieveable, the following key changes will be introduced under the CWMS:

1. "A shift from effects-based management of individual consents to integrated management based on water management zones
2. Management of the cumulative effects of water abstraction and land use intensification
3. Water allocation decisions that address sustainable environmental limits and climate variability

4. Actions to protect and restore freshwater biodiversity, amenity values and natural character" (Canterbury Water Management Strategy, 2010, p. 7).

Lomax, Memon, & Painter (2010) conducted a review of the CWMS to determine whether the collaborative governance process had been successful. They concluded that "the process of crafting the CWMS has been very successful as an exercise in building consensus to manage a highly contested resource" (Lomax et al., 2010, p. 25). However, they also identified that there are deep rooted tensions that could derail consensus on how to implement the Strategy, with a particular focus on the following big-picture issues:

- "long-term sustainability of intensive, irrigation-based agriculture in Canterbury;
- conflict within the local government sector in Canterbury about institutional arrangements to implement the Strategy; and
- conflict with central government's short-term macro economic objectives" (Lomax et al., 2010, p. 25).

In order to shift to an integrated management system, the CWMS has divided the Canterbury region into ten water management zones, each under the oversight of a zone committee. These zones are large enough to integrate management of abstraction from surface and groundwater with the management of irrigated areas, but also small enough to encapsulate local catchment issues (Canterbury Water Management Strategy, 2010). A set of measureable outcome targets have also been developed for these sub-regional zone committees to "align water management practices with the following regional planning targets: drinking water, irrigated land area, energy security and efficiency, ecosystem health/biodiversity, water use efficiency, kaitiakitanga, regional and national economic growth, natural character of braided rivers, recreational/amenity opportunities, and the setting of environmental limits" (Canterbury Water Management Strategy, 2010, p. 8).

2.2.2 Hurunui-Waiau zone

The Hurunui-Waiau is the largest of the ten CWMS water management zones, covering an area of 8661 square kilometres (Duncan, 2014b) (see Figure 1). The Hurunui, Waiau, Waipara and Conway/Tutae Putaputa are the four main river catchments in the zone (Canterbuy Regional Council, 2012), but only the Hurunui and Waiau catchments are covered by the Hurunui and Waiau River Regional Plan (HWRRP) (Duncan, 2014b), which became operative on the 20th of December 2013 (Rutherford, 2017). Furthermore, the HWRRP sits separately from the recently notified Canterbury LWRP (Duncan, 2014b). As a result, unlike the other nine water management zones in Canterbury, the Hurunui-Waiau zone is not bound by OVERSEER® as a limit setting tool for nitrogen losses

(Duncan, 2016). Instead, cumulative effects are regulated by "in-stream nutrient concentrations and load limits that trigger land use rules that dictate what can be done on land" (Duncan, 2016, p. 153).

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Figure 2-1 Map of Hurunui-Waiau zone.

The dark blue colour shows the Hurunui-Waiau catchment area and to remain compliant, farmers in this area must be part of an environmental collective scheme. The other colours indicate the different nutrient allocation zones for farms outside the catchment area. In the red zone it is prohibited to increase nitrogen loss from the property. In the orange zone, to be a permitted activity you may not increase nitrogen by more than 5kg N/ha above the nitrogen baseline calculated by OVERSEER. If the property is greater than 50 ha in size, then it is a restricted discretionary activity and a farm activity resource consent, farm environment plan and a maximum N loss are required. In the light blue zone it is permitted to increase nitrogen loss by no more than 5kg N/ha above the nitrogen baseline calculated by OVERSEER and only becomes a restricted discretionary activity if the increase is greater than 5kg N/ha.

Concerns around water quality in the Hurunui-Waiau catchment came to the forefront following a significant algal bloom in the Hurunui River in 2001 (DairyNZ, 2011). In the years leading up to the algal bloom, a large number of farms in the area were being converted to dairy, and border dyke irrigation was widely used (DairyNZ, 2011). It became evident that the nutrient by-wash from border dyke irrigation was causing significant pollution in the Pahau River, which is one of the main tributaries of the Hurunui River, with high levels of phosphorus and *E. coli* detected in the river

(DairyNZ, 2011). Locals at the time witnessed “great green balls of slime floating under the Hurunui Bridge” and some experience health issues that they attributed to the state of the river (Stakeholder 4, personal communication, 31 July, 2018). This led to the formation of the Pahau Enhancement Group, a group of 16 farmers who began fencing off waterways and constructing storage ponds for the irrigation run-off to prevent it from running into the Pahau (DairyNZ, 2011). The health of the Pahau River has since improved significantly, and the river won the supreme award for the most improved river in 2017 based on reductions in *E. coli* levels.

The HWZC was created in accordance with the CWMS, and was the first of the zone comittees to finalise a Zone Implementation Programme (ZIP) and have it moved through the RMA statutory process (Duncan, 2014b). Two of the key recommendations from the 2011 version of the ZIP were as follows:

1. “Flow and allocation regimes need to be set for the rivers and their tributaries to ensure the life supporting character of the rivers is maintained
2. Nutrient load limits need to be set for the major rivers and their tributaries” (Environment Canterbury, 2013, p. 5).

Setting environmental limits in the Hurunui-Waiau while simultaneously increasing the area of irrigated land is proving to be a highly controversial and challenging issue and is halting the implementation of key parts of the HWRRP (Duncan, 2014a).

One of the key targets of the HWZC ZIP is to expand the area of irrigated land by approximately 30,000 hectares by constructing the proposed Hurunui Water Project (HWP) (Hurunui Waiau Zone Committee, 2011). A further 100,000 hectares of land has also been identified as irrigable (Hurunui Waiau Zone Committee, 2011). In regards to the environmental outcomes of this expansion, the ZIP outlined the need for water quality to be “maintained at current levels or improved” and it was stated that the “Zone Committee believes that existing good farm management practices and the adoption of future best practices by all land/water users can result in both future nutrient load limits being met and full irrigation development occurring in the Hurunui Basin in future years” (Hurunui Waiau Zone Committee, 2011, pp. 34-36). The expectation of the HWZC was that by making this shift, the requirements for the nutrient ‘headroom’ needed to allow the development of new irrigation schemes would be met (Duncan, 2016).

The increased irrigation and intensification of farming in the region began impacting on water quality, which has consequently led to a significant shift in environmental management processes. AIC is responsible for providing water to farmers in this region and AIC was required by ECAN to

establish the AIC Environmental Collective, which has been registered under Schedule 2 of the HWRRP (Rutherford, 2017). Unlike irrigation schemes in the Waikato and Taranaki regions where water reliability is lower, AIC is able to deliver water with 99% reliability, which will be lowered to 95% if the minimum flow rate for the Waiau River is increased (K. Hughey, personal communication, 5 March, 2018). The purpose for establishing the AIC collective was to allow AIC shareholders to fulfil the requirements of Rule 10.1 of the HWRRP to retain consent as permitted land-use activities, particularly in relation to maintenance of minimum flows in the Hurunui and Waiau rivers (A. Rutherford, personal communication, 10 May, 2018).

2.2.3 Nutrient allocation and OVERSEER®

To remain compliant under the HWRRP, farmers must have joined a collective scheme (such as the Amuri Irrigation Environmental Collective) by 1 January 2017, and must also develop an FEP, keep all annual nutrient budgets from 2012 and prevent an increase in nutrient loss greater than 10% for both nitrogen and phosphorus (DairyNZ, N.d.). AIC has a responsibility to meet recommendations outlined by the ZIP and HWRRP and have identified the following recommendations as being particularly important for the collective scheme:

> 1. "The water quality of the Hurunui River at SH1 should be at or about the same or better standard than at present;
>
> 2. Current land users will need to improve nutrient management to allow new irrigation development to occur;
>
> 3. New irrigation must have good nutrient management; and
>
> 4. Implementation of a sustainable best practice audited self-management programme, particularly for water quality, led by community/land user land care groups and industry is essential" (Rutherford, 2017, p. 3).

The implementation of the HWRRP has not been without contention, especially in regards to the allocation/sharing of nutrient load between dairy farmers and dryland farmers in the region (K. Hughey, personal communication, March 5, 2018). A group of 100 mainly dryland farmers, called the Hurunui District Landcare Group (HDLG), was established in 2016 to "increase the uptake of good environmental farm management practices and to work toward a fair regulatory outcome for farmers with low environmental impact" (Environment Canterbury, 2016, p. 1). Farmers in this group typically run a mix of deer, dryland cropping, sheep, beef or dairy support and operate with relatively low nitrogen and phosphorus loss risk (Hoban, 2015). Some farmers have irrigated areas on farm, but the overall impact of the dryland farms in the zone on water quality is "relatively small compared to intensive, irrigated land uses" (Hoban, 2015, p. 3). For the farmers under the HDLG, the

HWRRP provides very limited opportunities for future development and also classifies seasonal variations in pasture production as a land-use change, which would require the farmer to apply for a resource consent to be able to farm (Environment Canterbury, 2016). The HDLG is not an official 'Collective' as defined by the HWRRP as the group decided they would achieve more by focusing on the 2018 plan review instead of "forming to comply with the current, unacceptable plan requirements" (Hoban, 2015, p. 2). Low emitting farmers are currently subject to the '10% rule' whereby they are not able to intensify nutrient loads by more than 10% of their OVERSEER® nutrient budget (Environment Canterbury, 2016).

The OVERSEER® model was first developed in 1998 and is jointly owned by the Ministry of Primary Industries, AgResearch Limited and the Fertilizer Association of New Zealand (Duncan, 2014a). OVERSEER® is used by farmers and farm consultants to create nutrient budgets that identify how nutrients are being used, the type of fertiliser required to maintain soil fertility, anticipated nutrient loss and greenhouse gas emissions and the impacts of changing farm management practices or systems (Duncan, 2014a; Watkins & Diana, 2015). Its original purpose was as a scenario-based, planning tool through which farmers could model and predict the outcomes of adjusting fertiliser rates and other farming inputs for productivity and environmental damage (Williams et al., 2013).

The accuracy of the OVERSEER® nitrogen output estimates has an error range of ± 20 to 30 per cent due to the high variability within paddocks on individual farms and differences between farms (Duncan, 2014a; Williams et al., 2013). As OVERSEER® is a predictive model, the estimated nutrient output is only as credible as the input information and model assumptions (Duncan, 2008). This is a key concern for farmers, as the large margins of error in the OVERSEER® model could lead to farmers being caught by land-use change rules even where the farmer has not changed land-management practices (Duncan, 2014a).

Despite the good intentions of the OVERSEER® model, the implementation of regulatory policy based on model outputs has not been well received by the farming community. Farmers are not convinced that use of the OVERSEER® model will solve the fundamental issues of degraded water quality (Duncan, 2016). The allowable level of nitrogen that each farm can leach each year is calculated from the OVERSEER® baseline of the average leached nitrogen from the last five years. This is unfair to small-scale farmers, such as those under the HDLG, as it will not seriously impact intensive corporate farms (that leach higher rates of nitrogen) as they will still be able to release nitrogen at a much higher level than small scale farmers (Duncan, 2016).

2.3 Environmental factors

2.3.1 Environmental Management Systems (EMS)

Business sectors use a variety of management systems to improve efficiency and profitability, improve compliance and minimise risk, with EMS focused specifically on managing environmental impacts and associated risks (Carruthers, 2011). EMS is of growing interest to farming organisations and relevant industry groups as it enables these groups to provide proof of clean and green agricultural practices (Higgins, Dibden, & Cocklin, 2008). This allows increased market access, particularly to higher value markets, as well as increased income subject to the farmer maintaining environmentally sustainable practices (Chang & Kristiansen, 2006). EMS is designed to:

> "…assist with the recognition of environmental impacts, compliance issues, risk and liabilities; develop an environmental policy that clearly states the aspirations, methods and timeframes to address these impacts; gather and refine the information and data needed to meet the policy aspirations; and review and evaluate management choice in light of whether the outcomes achieved met those specified within the environmental policy"(Carruthers, 2005, p. 1).

Regulatory bodies tend to value the ability of EMS to provide farmers with incentives to improve their environmental sustainability and business management processes (Carruthers, 2011; Higgins et al., 2008). In Australia, EMS have been favoured by the government over organic agriculture certification due to their ability to be incorporated into conventional agricultural practices (Higgins et al., 2008).

The adoption of an EMS is voluntary and the overall success of the system therefore depends on the capacity and skill level of the implementers (Carruthers, 2011). A key benefit that the voluntary structure of EMS provides is the ability for industries to self-regulate and develop context-driven best management practices instead of following broad 'top-down' schemes (Nash & Coglianese, 2010). EMS schemes are also becoming increasingly recognised by regulatory and policy agencies (Nash & Coglianese, 2010). For a system to be effective, constant feedback is required from monitoring, measuring, reporting and auditing (Carruthers, 2011). For the Hurunui-Waiau context, the EMS system that has been established by AIC has allowed industry to have greater control over regulation of farm environment practices and the auditing process is a key instrument in monitoring the effectiveness of the system.

2.3.2 Water issues in the Hurunui-Waiau

In the late 1970s, the Waiau Plains Irrigation scheme was built in response to periods of drought and was only originally intended for protection against future droughts (Edkins & Tipples, 2002).

However, the increased accessibiilty of water saw the first dairy conversion take place in 1983 (Edkins & Tipples, 2002). Many farmers in the region followed suit due to the increased profitibility of dairy farming and as a result, the Hurunui-Waiau is now dominated by dairy and dairy support farms (Rutherford, 2018). Farmers in Canterbury suffered through a severe drought in the summer of 1997/1998 and the worst affected farmers were those that did not have access to freshwater for irrigation, leading to a subsequent demand for new private irrigation schemes (Kirk, Brower, & Duncan, 2017).

The Canterbury Strategic Water Study identified the Hurunui-Waipara area as having land suitable for irrigation but that it was limited in regards to a reliable water supply (Morgan et al., 2002). The reliability of freshwater supply for run-of-river irrigation schemes, such as the AIC scheme, is dependent on river flow, thus low flow conditions increase the vulnerability of surface water irrigation schemes (Jenkins, 2018). It was determined that it would be possible to meet future demand for water supply; however, this would require storage on alpine rivers during periods of high river flow to allow for water usage during restricted use periods when river flows were low (Jenkins, 2013c, 2018). However, concerns were raised about the potential impacts of constructing dams such as "reduction in braided river character, intrusion on areas of high naturalness, algal blooms downstream of storage, de-oxygenation in reservoirs, weed growth in reservoirs and reduced sediment transport" (Jenkins, 2018, p. 435). Further concern was also raised around increasing the intensification of farming practices, such as degradation of water quality from increased nitrogen and phosphorus input as well as increased *E. coli* levels and the increase in sediment present in the river bed (Jenkins, 2018; Kirk et al., 2017). In particular, the dam on the south branch of the Hurunui River that was proposed as part of the original consent application for the Hurunui Water Project (HWP) had the potential to "modify downstream flow and sediment transport, have downstream effects on braided character and increased algal blooms, as well as affect recreational uses" (Jenkins, 2013b, p. 89). It was subsequently decided by ECAN that no new dams were to be constructed on the mainstems of any major alpine rivers in the region (Jenkins, 2018).

As an alternative to introducing water storage to the different catchments, it was suggested that a more sustainable strategy, both environmentally and financially, was to increase the efficiency of already allocated water resources (Jenkins, 2018). In order to achieve this, the following shifts in practice were suggested:

"(a) Shifting to more efficient irrigation technology,

(b) matching irrigation application to times and degree of soil moisture deficit while leaving capacity for absorbing rainfall,

(c) limiting application rates to prevent macro-pore flow,

(d) using closed pipes for distribution of water rather than open canals, and

(e) changing the spatial application of irrigation in a groundwater zone to using surface water in the upper part of the zone with increased leakage available for extraction in the lower part of the zone" (Jenkins, 2018, p. 436).

Despite the benefits of improving water use efficiency within the catchment, it was concluded that it would not be enough to eliminate the need for storage to improve water availability (Jenkins, 2018).

In order to develop a water storage strategy for the Hurunui-Waiau, the CWMS collaborative governance approach was adopted with hopes of achieving a sustainable outcome with lower impacts and greater level of community acceptance (Jenkins, 2013c; Kirk et al., 2017). Collaborative governance has been used increasingly in New Zealand to manage freshwater and is defined as "the processes and structure of public policy decision making and management that engage people constructively across the boundaries of public agencies, levels of government, and/or the public, private and civic spheres in order to carry out a public purpose that could not otherwise be accomplished" (Emerson, Nabatchi, & Balogh, 2012, p. 3). The allocation of freshwater has created tension between different stakeholder groups due to the opposing views on how freshwater should be used. Irrigators are demanding increased access to freshwater for economic purposes and environmental groups are opposed to this as increased abstraction and more intensive farming systems result in lowered environmental flows and the degradation of water quality (Kirk et al., 2017). Collaborative decision-making processes have been introduced as a way to mediate and resolve tensions between these groups (Kirk et al., 2017).

In the case of the Hurunui-Waiau region, the need for storage led to the establishment of the Hurunui Water Project Ltd (HWP) in 2009 (Jenkins, 2013a). As a result of the Canterbury Strategic Water Study, the following potential storage options were identified for the region:

1. Lake Sumner: control of outflows using a control gate structure
2. Hurunui South Branch: construction of a 75m high dam
3. Mandamus: construction of dam upstream of the Hurunui junction
4. Waitohi: storage in tributaries with pumped flows coming from the Hurunui
5. Pahau: construction of a 35m high dam

6. Waipara: potential sites on Greys Road and Clarke Hall Road (Morgan, Dark, & Ward, 2010)

After analysing the range of options, HWP applied for a resource consent to develop storage on both Lake Sumner and the south branch of the Hurunui, however Fish & Game and Whitewater NZ had lodged an application for a Water Conservation Order (WCO) for the protection of the Hurunui River (Jenkins, 2013a). In August 2009 the Special Tribunal recommended that a WCO be granted to the north branch of the Hurunui but not the south, which Whitewater NZ then appealed to the Environment Court (Jenkins, 2013a). However, in 2010 when the elected ECAN councillors were replaced by the appointed commissioners, they were provided with new powers to regulate freshwater management in the region (Kirk et al., 2017). This included the ability to enforce moratoria (temporary prohibition of an activity) over freshwater consents, amend or remove WCOs in Canterbury and limit the ability to lodge appeals to the Environment Court (Environment Canterbury, 2010). The appointed commissioners utilised this power and placed a moratorium on all water consent applications that were associated with the Hurunui from July 2010 until October 2011 and also for the Waiau River from December 2010 until October 2011 to allow time to develop a regional plan and storage strategy for the Hurunui (Jenkins, 2013a).

In order to develop a storage strategy, RMA processes were set aside and the HWZC was tasked with using collaborative decision-making processes to agree on a strategy that was accepted by the various stakeholders in the catchment (Jenkins, 2013a). The collaborative decision process saw the HWZC establish the Waitohi Selection Panel, which reviewed and recommended on the preferred storage strategy from the three Waitohi options (Jenkins, 2013a). All three proposals avoided the main concerns of the initial proposal as the main-stem of the braided river was not to be dammed and the levels of Lake Sumner would not be altered (Jenkins, 2013a). The Selection Panel determined that the Hurricane Gully option was the most suitable alternative, which involved constructing four storage dams on the Waitohi River as well as on-plains storage that allowed a further 58,500 ha of land to be irrigated in the Hurunui, Kowai and Waipara catchments (Jenkins, 2013a).

It was identified by the CWMS that to allow for increased nitrogen leaching to occur in the region whilst maintaining groundwater quality, farmers needed to improve their land management practices and incorporate new technologies into their systems (Jenkins, 2013b). There was an initial zone committee agreement, which was based on extensive scientific input, to limit the nutrient loads in order to maintain the water quality levels as set out below:

- “Nutrient load limits must be set for the major rivers and their tributaries;

- The water quality for Hurunui River at State Highway One should be at or about the same or better standard as present;
- Current land users will need to improve nutrient management to allow new irrigation development to occur;
- New irrigation development must have good nutrient management;
- Implementing load limits should take a tributary and land/water user-based approach" (Hurunui Waiau Zone Committee, 2011, p. 4).

To create sufficient headroom to significantly expand the irrigated land area in the catchment, a 30 to 50% reduction in nutrient losses was required from existing land users (Brown, 2012). It was shown that if all farms in the catchment adopted industry best practice for nutrient management and converted from border dyke to spray irrigation then it "might lead to at most a 17% reduction in existing on farm nitrogen leaching losses and hence nitrogen load in the rivers" (Salmon, Kirikir, & van Voorhuysen, 2013, p. 45). This would allow 3159ha of the Balmoral Forest to be converted to dairy as well as an additional 6679ha of land use intensification; however if the allowable nutrient load was increased by 25%, it would allow for an extra 18600ha to be converted from dryland sheep and beef farming to dairy and for Ngāi Tahu's proposed conversion of 7000ha of the Balmoral Forest to dairy and Stage 1 of the HWP to irrigate an additional 15000ha provided that all border dyke irrigation was converted to spray irrigation (Jenkins, 2018c; Salmon et al., 2013).

Stage 1 of the HWP proposed Waitohi Irrigation and Hydro Scheme involves the filling of small reservoirs along the Waitohi River catchment and introducing on-farm storage (Salmon et al., 2013). Emu Plains Irrigation have also applied for a water take consent to develop in the Waiau catchment and use the water over a 25000ha area (Hurunui Waiau Zone Committee, 2018d). However, these proposed schemes would cause an exceedence of the nitrogen load limit for the catchment unless farmers drastically reduced their nitrogen output rates.

In 2013, the Livestock Improvement Corporation and Dairy NZ moved for nitrogen loads to be increased in the catchment to create headroom to allow for further irrigation development based on the Hurunui River being phosphorus limited in terms of periphyton growth (Ausseil, 2010; Jenkins, 2018c). In lay terms, if there was increase in nitrogen levels in the lower Hurunui River it should not result in increased periphyton growth as long as phosphorus levels remain the same. It was also argued that it was not possible to set nutrient load limits for the Waiau River due to insufficient monitoring data (Salmon et al., 2013). Increasing the nitrogen load limit was deemed necessary by the Council as it had become clear that their original assumption that "existing farmers could reduce

their nitrogen leaching by as much as 50% to create headroom for irrigation expansion and land-use intensification, was erroneous" (Salmon et al., 2013, p. 44).

It was proposed by the Council in 2013 that the Schedule 1 nitrogen load at State Highway 1 be increased by 25% until 2017, however Fonterra and DairyNZ lobbied for the nitrogen load limit to be increased by 25% from 2012 to 2022 and then by 50% after 2022 (Salmon et al., 2013). This was opposed by North Canterbury Fish & Game who were against any increase in Schedule 1 nitrogen load limits (Jenkins, 2013b). After considering both arguments, the Council decided later in 2013 to allow for a moderate increase in the Schedule 1 nitrogen load for the Hurunui River at SH1 by 25% until 2017 as it represented "an appropriate balancing of the risks of relying on single nutrient management in terms of controlling execssive pheriphyton growth (namely allowing nitrogen loads to increase but retaining current phosphorus loads) and enabling social and economic wellbeing through increased irrigation and associated conversion of drystock farming to dairying or other intensive land uses" (Salmon et al., 2013, p. 46). Furthermore the Council implemented Rules 10.1 to 11.2 in the Plan, which state that any land use change (defined as a 10% or larger increase in nitrogen or phosphorus leaching) that occurred after 1 January 2017 were "permitted providing Schedule 1 catchment load limits for nitrogen and phosphorous were not exceeded and the landowner also joined an audited self-management scheme of one form or another. Land uses not meeting the respective permitted activity conditions were required to consent as discretionary activities" (Salmon et al., 2013, p. 48).

The Waiau River is considered to be lower risk for reaching nitrogen and phosphorus limits in comparison to the Hurunui due to the relative frequency of flushing flows in the Waiau River and the implementation of load limits has not been prioritised at this point as there has yet to be an issue with excessive periphyton growth (Hurunui Waiau Zone Committee, 2018c). However, future development of irrigation schemes (such as the Emu Plains) have the potential to increase periphyton growth; therefore future consent applications must provide evidence that land use intensification will not exceed the limit for periphyton growth in the Waiau (Hurunui Waiau Zone Committee, 2018c).

In 2018, it now seems highly improbable that the HWP water storage scheme on the Waitohi River will go ahead and the zone committee has requested that HWP, AIC and Ngāi Tahu Farms work together to develop an integrated water storage solution for the catchment (Hurunui Waiau Zone Committee, 2018b). AIC have been investigating options to construct a water storage facility on the Glenrae River catchment, located on the north bank of the Upper Hurunui River, which would have capacity to store 18 million cubic metres (Hurunui Waiau Zone Committee, 2018a). The water would

be dammed at the location of the water storage facility and would be released into the Glenrae River, which flows into the Hurunui River, during periods of high demand for irrigation thus allowing farmers to abstract and use the water without having to change their facilities or resource consents (Hurunui Waiau Zone Committee, 2018a). However, this approach still offers little integration between the major irrigators in the catchment. Instead, the current proposal is to construct a water storage facility on the Balmoral side of the Hurunui and use AIC's piped system to transport water to farm boundaries and has involved collaboration between HWP, AIC and Ngāi Tahu Farms (Stakeholder 4, personal communication, 31 July, 2018).

2.3.3 Minimum flow rates

When the HWRRP became operative in December 2013, it set out provisions for an increase in the minimum flow rate for the Hurunui River from 12 to 15 cumecs and an increase from 15 to 20 cumecs for the Waiau (Environment Canterbury, 2013). These new minimum flow rates have yet to be fully implemented for both rivers. The zone committee negotiated an initial deferment package with AIC to allow farmers within the catchment a period of five years to implement FEPs and GMPs without being subject to increased minimum flow rates (Hurunui Waiau Zone Committee, 2017b). AIC was able to make significant progress over that five-year period, with all farms in the catchment converting from border dyke to spray irrigation, developing and being audited on FEPs, an overall improvement in audit grades and a shift to ensure farmers are operating at GMP (Hurunui Waiau Zone Committee, 2017a).

The initial deferment package that was agreed between the HWZC and AIC is set to expire soon, and AIC is now looking to develop a second deferment package (the Staged minimum flow and environmental enhancement package) with the zone committee to further delay the enforcement of the HWRRP 2013 increased minimum flow rates (Hurunui Waiau Zone Committee, 2018a). If the package is not accepted, the alternative option would require AIC to renew their consent under ECAN in 2021, which would incur significant costs. AIC would also be able to appeal the consent process, which could push the implementation of the minimum flow rates to around 2025. Therefore, according to AIC the best way forward would be for the Zone Committee to accept their second deferment package. The proposed package consists of two major components:

> "1. Staged increased to minimum flows in the Hurunui and Waiau Rivers.
>
> 2. A range of mitigation and environmental enhancement projects designed to address the effects of lower minimum flows." (Hurunui Waiau Zone Committee, 2018a, p. 22)

Table 2-1 below sets out the proposed staged increase in the minimum flow rates, which would result in the deferment of the HWRRP 2013 minimum flow rates until 2025-26 (Hurunui Waiau Zone Committee, 2018a). If the proposed package is accepted by the Zone Committee then in the 2018/19 irrigation season, the minimum flow rates for both rivers will be increased by 1 cumec and then will be staged over the next seven to eight years. The proposed minimum flow rates are for the February-March period for the Waiau River and the January-April period for the Hurunui River and for the remaining months the HWRRP minimum flow rates are to be followed (Table 2-1).

Table 2-1 AIC proposal for staged increases to minimum flow rates as presented to the Zone Committee, June 2018 (Hurunui Waiau Zone Committee, 2018a).

Season	Waiau Irrigation Scheme	Balmoral Irrigation Scheme
	Minimum flow (m^3/s)	Minimum flow (m^3/s)
2018-19	16	13
2019-20	16	13
2020-21	16	13
2021-22	16	13
2022-23	18	13
2023-24	20	13
2024-25	20	13
2025-26	20	13

In terms of the environmental enhancement and mitigation projects, AIC has proposed that they will fund the following components:

> "1. Enhancing cultural knowledge and mahinga kai[2] values;
>
> 2. Improving Hurunui and Waiau River hapua[3];
>
> 3. Enhancing spring-fed streams;
>
> 4. Enhance riverbed bird habitat;

[2] Mahinga kai refers to traditional Māori food and other natural resources and the places where those resources are obtained.
[3] Hapua refers to a lagoon separated from the sea by a narrow barrier and is located at the mouth of large braided rivers.

5. Wetland enhancement;

6. Reducing nitrogen inputs to Hurunui and Waiau Rivers;

7. Mitigate the risk of adverse impact on salmon passage;

8. Soil moisture monitoring;

9. Public access;

10. Managed aquifer recharge trial;

11. Hydro-electricity generation" (Hurunui Waiau Zone Committee, 2018a, p. 23).

Some of the major water users in the catchment have consents that are not due for renewal for decades, such as AIC who have water take consents until 2033 for approximately 60% of the allocation block for the Hurunui River and 65% of the allocation for the Waiau River (Hurunui Waiau Zone Committee, 2018c). Environmental groups, particularly North Canterbury Fish & Game and Forest & Bird, are heavily opposed to the further deferment of implementing the HWRRP 2013 minimum flow rates and believe that the best way to improve water quality in the Hurunui and Waiau rivers is to implement the minimum flow rates as soon as possible (Hurunui Waiau Zone Committee, 2017b). If current minimum flow rates are continued, the river will be drawn down to inadequate levels for longer time intervals, such as when the Waiau River mouth closed over in a recent trout spawning season (Hurunui Waiau Zone Committee, 2018d). Whilst AIC has achieved some significant milestones over the past few years, concern has been raised by environmental groups that the biggest gains have been used to further intensify farm development in the catchment (Hurunui Waiau Zone Committee, 2017b). These groups have also concluded that whilst the proposed package from AIC will provide some ecological benefits to the catchment, they are "unlikely to make a significant material difference (step-change) to the overall water quality challenges and threats in the zone, as they currently stand" (Hurunui Waiau Zone Committee, 2017b, p. 21). Continued delay in implementation of the HWRRP 2013 minimum flow rates will potentially lead to the following environmental implications:

- significant impacts on salmon migration particularly in the Waiau River;
- increased risk in mouth closures particularly for the Waiau River
- negative impacts on riverbed bird nesting along the Hurunui River
- small effects on periphyton growth and groundwater quality (Hurunui Waiau Zone Committee, 2017a).

2.4 Institutional factors

2.4.1 Amuri Irrigation Environmental Collective

For each farm under the AIC Environmental Collective, an FEP was developed, which sets out specific targets that need to be met to be considered an environmentally sustainable operator. The purpose of the individual farm FEPs is to provide a tool for farmers to identify and manage on-farm environmental risks that have the potential to impact on water quality, biodiversity and cultural values through implementing GMP (Rutherford, 2017). AIC will utilise the individual FEPs as the primary mechanism for achieving the purpose and objectives of the AIC Irrigation Scheme Management Plan, which is the guiding document for the AIC Environmental Collective (Rutherford, 2017). The FEPs will be used to "evaluate and record each farm's environmental performance, agreeing [on] actions for further improvement and an auditing system to measure progress, reward good behaviour and focus compliance on poor performance and highest risk" (Rutherford, 2017, p. 12). To ensure compliance, audits are carried out by an ECAN approved Independent FEP auditor and follow the audit procedures of the Canterbury Certified FEP Auditor Manual whereby grades are awarded from A to D based on the environmental performance of each farm (Rutherford, 2017). To be able to make changes to the farming system the farmer must be sitting at least at a 'B' grade. In Table 2-2 below, the Environmental Management Area Objectives are classified as to whether the auditor has high, medium or low confidence that they are being met.

The audit reviews the following six management areas: "irrigation management; soil management; nutrient management; waterway, native vegetation and riparian management; collected animal effluent management; and environmental hotspots (point source risks)" (Rutherford, 2017, p. 14) and determines whether the objectives are being met with high, medium or low confidence (Jenkins, 2018). It is crucial that the auditing process is independent, systematic and documented (Gunningham, 2007) to ensure the accountability and transparency of the AIC Environmental Collective scheme.

Figure 2-2 shows the AIC Farm Environment Plan auditing process, including the sequence of events which follow the award of each grade. If a farm receives a 'C' or 'D' audit grade the farmer is informed of the actions that need to be urgently addressed and that the Chairman of the Environmental Subcommittee (for a 'C' grade) or the Environmental Subcommittee (for a 'D' grade) will be notified about the grade (Rutherford, 2017). Once the repeat audit has been conducted, if the farm receives another 'C' or 'D' grade they will again be informed of the actions that need to be urgently addressed, however "failure to act to improve the grading by the next audit will trigger non-

Table 2-2 FEP auditing: Level of confidence, grading and repeat inspection (Rutherford, 2017)

Confidence Environmental Management Area Objectives Being Met	Overall Assessment	Grading	Action to be Taken and Repeat Inspection	
All High	High level of confidence that all environmental objectives are being met.	A		No further farm inspection for four years unless significant changes in farm management.
5-4 High 1-3 Medium 0 lows	Some areas in need of further action but on-track to achieving objectives within agreed timeline.	B	Any revised actions recorded in FEP.	No further farm inspection for two years unless significant changes in farm management.
>1 Medium 0 Lows	Some areas in need of further action but not on-track to achieving objectives within agreed timeline.	C	FEP actions reviewed and revised actions and timelines for completion recorded in FEP.	Repeat inspection in 12 months. Further failure to make progress at repeat inspection will result in enforcement action.
Any Lows	At least one area in need of urgent attention. Reviewed FEP action agreed with timeline.	D	FEP actions reviewed and revised actions and timelines for completion recorded in FEP.	Repeat inspection in 6 months. Further failure to make progress at repeat inspection will result in enforcement action.

compliance procedures and the member could, therefore, be required to leave the collective" (Rutherford, 2017, p. 25). It is possible for a farm to be removed from the collective if they receive a third 'C' or 'D' grade within a five-year period, with the final decision being made by the Environmental Subcommittee. If a member is expelled from the Environmental Collective they will then be in breach of Rule 10.1 (a) or 10.2 (c) of the HWRRP, which are as follows:

> Rule 10.1 (a): "Any existing land use as at the date the Plan is made operative that results in a discharge of nitrogen or phosphorus which may enter water, in the Nutrient Management Area shown on Map 4, is a permitted activity provided that:
>
> (a) on or before 1 January 2017 the land is subject to:
>
> (i) an Industry Certification System; or
>
> (ii) a Catchment Agreement; or
>
> (iii) an Irrigation Scheme Management Plan; or

(iv) a Lifestyle Block Management Plan.

Rule 10.2 (c): Any change in land use (refer Part 5 – Definitions), in the Nutrient Management Area shown on Map 4, is a permitted activity, provided that:

(c) a water permit has been granted that authorises irrigation on the land and includes conditions that:

(i) specify the maximum annual amount of nitrate-nitrogen that may be leached;

(ii) specify measures to minimise the loss of phosphorus; and

(iii) the land is subject to:

(i) an Industry Certification System; or

(ii) a Catchment Agreement; or

(iii) an Irrigation Scheme Management Plan; or

(iv) a Lifestyle Block Management Plan." (Environment Canterbury, 2013, pp. 25-26).

In the case that the expelled member is an AIC shareholder, they will also be breaching their water supply agreement with AIC, who are able to take further action based on the dispute resolution clauses of the water supply agreement (Rutherford, 2017).

AIC has now completed three auditing rounds over the past three years and have observed an overall improvement in performance of the farmers under the scheme. After the first round of auditing, 11% of farms under the scheme were awarded an 'A' grade, 62% received a 'B' grade, 20% received a 'C' grade and 7% were given a D grade (Jenkins, 2018). The scheme membership numbers have also continued to grow, with 51 new farms being audited in the most recent 2017/18 auditing round (Rutherford, 2018). Consequently, it is not possible to directly compare the grade distributions between the three auditing rounds as the number of farms is not consistent. However, in terms of the farms that were re-audited in the 2017/18 round, all of the 'C' grades moved to 'B' grades (A. Rutherford, personal communication, March 9, 2018). In addition, approximately one quarter of the re-audited farms received an 'A' grade in the 2017/18 round, which is much higher than the first round of audits where 10% of farms were awarded an 'A' grade (Table 2-3).

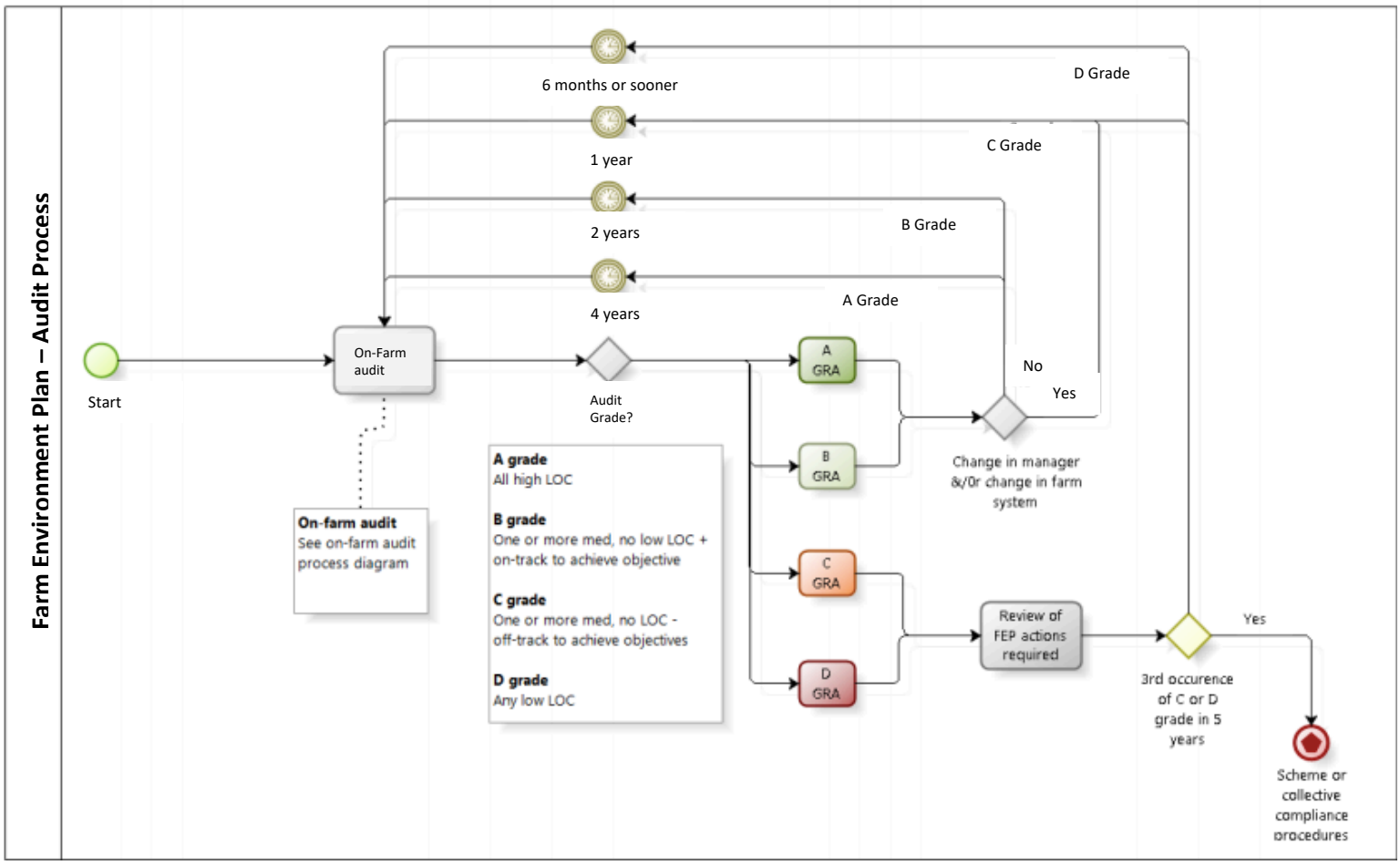

Figure 2-2 AIC Farm Environment Plan auditing process (Rutherford, 2017)

Table 2-3 provides a breakdown of the audit grade distribution for the 2015/16, 2016/17 and 2017/18 audit rounds:

Table 2-3 Distribution of audit grade by campaign (Rutherford, 2018)

Campaign	A		B		C		D		Total
	No.	%	No.	%	No.	%	No.	%	
2015/16	5	10	33	65	10	20	3	6	51
2016/17	7	14	29	58	13	26	1	2	50
2017/18	19	18	69	65	17	16	1	1	106
									207
Re-audits 2017/18	13	24	34	62	7	12	0	0	54

Over the course of the three audit rounds, the AIC Environmental Manger noted that there appears to have been a large amount of farmer 'buy-in' to the scheme, which has led to the rapid and

widespread adoption of environmental practices (A. Rutherford, personal communication, March 9, 2018). The audit results indicate that since the introduction of the AIC Environmental Collective, farmers have made progress towards meeting the GMP requirements across all management areas set out under the ISMP (Rutherford, 2017). However, following the 2017/18 audit round it became apparent that different farm types had "different starting points, different strengths and weaknesses and pose a range of potential environmental risks" (Rutherford, 2018, p. 7). Therefore, to move all farms under the scheme to GMP, the needs of each farm type will need to be targeted using a range of approaches as "blanket measures or requirements are unlikely to be successful" (Rutherford, 2018, p. 7).

2.5 Social context

2.5.1 Dryland farmers

The new restrictions on nitrogen and phosphorus leaching for land-use change have become colloquially referred to as the "10% rule" and their implementation has been a highly contentious issue within the Hurunui-Waiau catchment. Dryland farmers predominantly have low nutrient losses that range between 5 to 20 kg N/ha/yr whereas irrigated farms tend to contribute between 30-100 kg N/ha/yr (Hurunui Waiau Zone Committee, 2018c). Dryland farmers, typically sheep and beef, are more severely restricted than dairy farmers, as the 10% rule allows a dryland farm with a baseline emission of 5kgN/ha/year to increase emissions by only 0.5kgN/ha/year, whereas a dairy farm with a baseline of 50kgN/ha/year is allowed to increase by 5.0 kgN/ha/year (Duncan, 2017; Jenkins, 2018). Therefore, dryland farmers have a much smaller margin of error for the management of nutrient loss in comparison to dairy farmers and they have expressed concern that there is not adequate flexibility under the 10% rule to allow for normal variations in farming, particularly around increased planting of fodder crops, which could result in them breaching the new land use change rule (Jenkins, 2018).

To further add to the tension, the 10% rule allowed AIC to increase its area of irrigated land in the Hurunui by "offsetting increased nitrogen loads from converting dryland sheep and beef farms to irrigated dairy farms, against decreased nitrogen loads from irrigation efficiency improvements on high loss rate farms, and secondly in the Waiau catchment by limiting expansion to 6.5% increase in nitrogen loadings" (Jenkins, 2018, pp. 76-77). Individual dryland farmers did not have the same ability to convert under the 10% rule. In response, the regional council issued an advice note stating that normal variations in dryland farming would not be classed as a change in land use as stipulated by the 10% rule and would not result in enforcement action (Jenkins, 2018).

However, this did not provide a high degree of certainty for dryland farmers and consequently the HWZC investigated a range of options. The simplest methodology would be to alter the definition of "change of land use" in the HWRRP to allow normal dryland farming to be a permitted activity without changing the policy or rule framework (Hurunui Waiau Zone Committee, 2018c). Under the NPSFM 2017 "any proposed new provisions for making dryland farming a permitted activity must maintain water quality" (Hurunui Waiau Zone Committee, 2018d, p. 28). Therefore, if there is an increase in nutrient loss that would lead to a decline in water quality it must be offset. Winter grazing is the greatest contributor to increased nutrient loss, so the zone committee recommended that no dryland farmer can increase their winter grazing by more than 10% without a consent (Hurunui Waiau Zone Committee, 2018c). It was also recommended that all farms should be implementing GMPs and that establishing FEPs is that best way to identify and monitor GMPs on their property, however it was not deemed necessary for dryland farmers to be audited on their FEPs (Hurunui Waiau Zone Committee, 2018c). Following extensive consultation, in August 2018, the HWZC passed a motion that has yet to be actioned recommending that:

> "The Canterbury Regional Council pursues a targeted change to the Hurunui Waiau River Regional Plan, to be notified in 2018. In addition to permitting dryland farming within previously specified limits, the plan change will address the current requirements for dryland farmers to be a part of a nutrient management collective and report nutrient losses by requiring that farmers undertaking a "normal dryland farming activity" to:
>
> a) hold and implement a farm management plan and provide that farm management plan to Environment Canterbury on request.
>
> b) report the area of their farm used for winter grazing of cattle on root vegetable or brassica crop, either
>
> i. through the Farm Portal or;
>
> ii. through a dryland farmers collective group that has the purpose of reporting the winter grazing area of their members in aggregate" (Hurunui Waiau Zone Committee, 2018c, p. 13).

Whilst progress has been made to rectify the unfair restrictions that have been imposed on the dryland farmers as a result of the 10% rule, if dryland farmers are allowed to increase their winter grazing by up to 10%, the additional nutrient loss must be offset somewhere else in the catchment. According to a plausible worst-case scenario model for increase in winter grazing, there was the potential for nitrogen losses into the Hurunui River to increase by 18 tN/year (Hurunui Waiau Zone Committee, 2018c). However all of the additional nutrient loss allowance for the Hurunui catchment has already been fully allocated in consents held by AIC, HWP and Ngāi Tahu Farms, therefore "to

ensure that permitted dryland farming is a "zero-sum" game, with respect to the Hurunui River nitrogen load, a reduction in nitrogen losses must be made by irrigated farms" (Hurunui Waiau Zone Committee, 2018c, p. 21). A study conducted by Brown (2015) found that if irrigators reduced their nitrogen loss by 5% it would offset the increased nitrogen loss from an intensification of dryland farms. This would be achievable if all irrigators reached 80% efficiency, which is a target of the AIC FEPs, and would result in no net increase in the overall nitrogen load in the Hurunui River (Brown, 2015). The Zone Committee has requested that the AIC, HWP and Ngāi Tahu Farms work together to determine how they will make reductions to allow for the small increase in nutrient loss that would result from allowing dryland farming to be a permitted activity (Hurunui Waiau Zone Committee, 2018c). This has yet to be resolved.

2.5.2 Hurunui-Waiau Zone Committee

The Terms of Reference for the HWZC were updated in December 2015 and set out the eligibility criteria for committee membership as well as the committee structure (Environment Canterbury, 2015). In order to be eligible for appointment onto the Zone Committee you "must either live in or have a significant relationship with the zone" (Environment Canterbury, 2015, p. 2). A working group consisting of representatives from ECAN, Hurunui District Council, Tūāhuriri and Kaikōura Rūnanga then recommend the members to be appointed, ensuring that there is a balance of interests represented on the committee (Environment Canterbury, 2015). ECAN and Hurunui District Council then receive the recommendations and appoint committee members accordingly (Environment Canterbury, 2015).

The structure of the zone committee is as follows:

> "1. One elected member or Commissioner appointed by Environment Canterbury;
>
> 2. One elected member appointed by each Territorial Authority operating within the Zone Boundary;
>
> 3. One member from each of Tūāhuriri and Kaikōura Rūnanga;
>
> 4. Between 4-7 community members from a range of backgrounds and interests within the community; with provision that this number may be exceeded if Environment Canterbury and each Territorial Authority operating within the zone boundary agree;
>
> 5. Environment Canterbury and Hurunui District Council will appoint their own representatives on the Committee. Tūāhuriri and Kaikōura Rūnanga will nominate their representatives and the appointments will be confirmed by Environment Canterbury and Hurunui District Council" (Environment Canterbury, 2015).

2.6 Theoretical frameworks

Before the mid-1980s, social science literature primarily focused on the economic rational actor theory (Simon, 1955) and the theory of planned behaviour (Ajzen & Fishbein, 1980) to explain the decision-making processes of farmers (McGuire, Morton, & Cast, 2013). This focus was shifted in the late 1980s following the development of the dual interests framework, which introduced the concept that farmers are not only focused on maximising economic benefits but are also driven by personal beliefs and attitudes on how farming practices should be carried out (Lynne, 2006; Lynne, Shonkwiler, & Rola, 1988). The following sections outline concepts that were developed following this shift in focus which are relevant to the proposed thesis topic.

2.6.1 Giddens' Theory of Structuration

The core concern of Giddens' structuration theory is the relationship between individuals and society (Giddens, 1984). Giddens argues that there should be a greater focus within the social sciences on analysing social practices, rather than individual experience or social structure (Giddens, 1984). According to Giddens, there is a duality of structure that incorporates both agency and structure and consequently, social phenomena are the product of the interactions between both factors (Burton & Wilson, 2006; Giddens, 1984; Jones & Karsten, 2008). Structure is defined by "rules and resources, organised as properties of social systems," with resources split into the following two categories: allocative ("transformative capacity generating command over objects, goods or material phenomena") and authoritative ("transformative capacity generating commands over persons or actors") (Giddens, 1984, pp. 25-33).

Social structure is subject to constant change from everyday social practices and we should view "social life as a series of ongoing activities and practices that people carry on, which at the same time reproduce larger institutions" (Giddens & Pierson, 1998, p. 76). Giddens' approach differs from the economic rational actor theory and theory of planned behaviour that focus on optimising return based on rational choices and the goal-directed nature of human behaviour (Ajzen & Fishbein, 1980; Simon, 1955). The focus of the theory of structuration is predominantly on "what people actually do" but recognises that actions are constrained according to the specific context that "places limits upon the range of options open to [them]" (Giddens, 1984; Jones & Karsten, 2008).

Burton & Wilson (2006) apply Giddens' theory of structuration to an agricultural context whereby agency is attributed to farmers and is observable in different social systems (farming culture), or individual characteristics (attitudes and identities). Structure is "based on rules (e.g. agricultural policy; politics), resources (e.g. farmland) or other exogenous forces (e.g. the wider political

economy of farming) influencing farmers' actions and thought" (Burton & Wilson, 2006, p. 96). I will apply this approach to the farmers under the AIC collective scheme to investigate the potential trigger points that have caused a shift in farm management practices and if there has been a change in the identity of a 'good farmer'.

2.6.2 Identity Theory

Identity theory stemmed from two key sets of ideas: symbolic interactionism (Mead, 1934) and perceptual control theory (Powers, 1973). Symbolic interactionism explored the components that make up identities and their functions, whereas perceptual control theory focused on understanding the purpose and goals that underlie all living things (Burke & Stets, 2009). According to identity theory, behaviour is defined as "how an individual expresses his/her identity as a person, in a particular role and/or social setting" (Burke, 1997; Stryker & Burke, 2000). Therefore, individuals have different identities depending on their social networks and the position they fill within each setting, which can be influenced by the social context (Burke & Stets, 2009; McGuire et al., 2013). Each identity will determine the position of an individual within a social structure and the behavioural standards that influence how an individual acts (McGuire et al., 2013).

Occupational identity has been classed to be "amongst the most important in the individual's pantheon of idealised role identities" (Burton & Wilson, 2006). In an agricultural context, each farmer has a set of high-level principles that determines their perception of what makes a good farmer and a series of low-level standards that correlate with specific goals and behaviours that support the high-level definition (Burton & Wilson, 2006; McGuire et al., 2013). An example of a high-level perception is kaitiakitanga and a low-level standard under this would be efficient water usage.

Previous studies have identified four recurring typological groups based on the analysis of farmer interviews, that are representative of specific approaches to agricultural production, which are as follows:

> (1) 'Traditional'—a conservative productivist farmer who maintains cultural notions of stewardship;
>
> (2) 'Agribusiness person'—a farmer who concentrates on agricultural production to the extent that the profit motive dominates and stewardship concerns are lessened;
>
> (3) 'Conservationist'—a farmer who focuses on environmental and life-style concerns; and
>
> (4) 'Entrepreneur'—a farmer who is shifting the focus away from standard agriculture towards non-agricultural sources of income (Battershill & Gilg, 1996; Marsden, Whatmore, Munton, & Little, 1986; Wilson, 1996).

These typological groups represent specific approaches to agricultural production from a western perspective and may be quite different in other socio-cultural contexts.

In earlier studies, the understanding of identity assumed a uniformity of identity, which implied that any farmer would be characterised by a singular, fixed type (Holloway, 2002; Ray, 1998). There are implications of uniformity of identity. For example, if a farmer under AIC was exposed to new environmentally focused ideas, such as shifting away from border dyke irrigation, it was previously thought that a reconstruction of the farmer's conceptions of how the world works would occur and lead to the subsequent adoption of the conservationist identity and shift towards conservation management practices (Coughenour, 2003).

2.6.3 'Good farmer' concept

There is growing evidence from the literature that farmers may resist changes in their management practices due to the potential loss of identity or social/cultural reward associated with the traditional approach to commercial agricultural practices (Burton, 2004). Farmers predominantly identify themselves first and foremost as food producers (Burton, 2004; McGuire et al., 2013). Within productivist farming, a 'good farmer' has traditionally tended to adopt an approach to agriculture, which can be defined as a "utilitarian approach to land-use based on intensive forms of agricultural practice (and accompanying attitudes, goals, roles and behaviours) that results in a uniform landscape" (Burton, 2004, p. 4). The distinction between a 'good farmer' and a 'bad farmer' was based on two key criteria: the physical appearance of the crop or animal and the crop yield per hectare or quality of each animal (Burton, 2004).

Productivist farming is based on maximising food production in accordance with the high-input, high-output industrial model of production (Burton & Wilson, 2006; McGuire et al., 2013). Typically high-input, high-output production is characterised by intensive fertilizer and agrochemical use, monocropping, high-tech machinery and high stocking rates (McGuire et al., 2013). Consequently decision-making processes tend to focus less on water quality and other environmental impacts (Burton, 2004; Burton & Wilson, 2006; McGuire et al., 2013). Increased soil erosion and degradation of ground and surface water are common, but often unintended, consequences of the productivist farming approach (McGuire et al., 2013). Due to the dominance of productivist systems, farmers tend to be viewed by the general public as business operators who have little regard for the environmental impacts of their decisions and are more focused on profitibility (McGuire et al., 2013).

In the face of increased regulatory and public pressure, a sub-section of farmers has shifted to a post-productivist approach to agricultural production (Burton & Wilson, 2006). Post-productivism is defined as an "approach not centred around intensive agricultural production that leads to the supposed 'heightened differentiation' of land uses and landscape" (Burton, 2004). Under the post-productivist approach, the emphasis is not on maximising food production, but is instead focused on achieving high environmental sustainability while remaining economically viable (Burton & Wilson, 2006). In contrast to the traditional productivist approach, post-productivism shifts to a more conservationist identity that allows for increased diversity in land management practices that are more focused on minimising negative environmental externalities and are less production driven (Table 2-4).

Table 2-4 Actor-based roles that may distinguish a 'productivist' from a 'post-productivist' approach to agriculture (Burton & Wilson, 2006; Wilson, 2001).

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More recently in the literature, the notion of multifunctionality has been developed as an alternative end-point in contrast to a simple binary differentiation between productivist and post-productivist regimes (Burton & Wilson, 2006). The concept of multifunctionality was first articulated by the

European Union to encourage farmers to shift to an agricultural system that focuses on the production function as well as environment and social functions (Bedrac & Cunder, 2006; Hollander, 2004). Multifunctionality recognises that "productivist and post-productivist action and thought can occur simultaneously - spatially as well as temporally," and are "characterised by a 'territorialisation' of agricultural regimes, with intensively farmed regions geared towards productivist food and fibre output, and post-productivist farming regions aimed at extensification, wildlife and habitat preservation and sustainable countryside management that also includes non-agricultural pursuits" (Burton & Wilson, 2006, p. 2). This allows for farmer identity to shift to include conservationist practices but still highlights the importance of producing food and fibre.

For an agricultural system to be considered multifunctional, ecological services, such as biodiversity, need to be jointly produced with agrocommodities (Bohnet, Potter, & Simmons, 2003; Hollander, 2004). Environmental sustainability is an important element of multifunctionality, with farmers displaying lower farming intensity and productivity but high(er) quality food products to match demand from consumers (Wilson, 2008). However, there is still a large knowledge gap in the literature regarding how farmers define the characteristics of a 'good farmer' as well as how trade-off decisions are made between profitability and environmental responsibility (McGuire et al., 2013). This research project will attempt to fill in some of these knowledge gaps for the Hurunui-Waiau catchment.

2.6.4 P/PP/MF model of agricultural change

The productivist/post-productivist/multifunctional model of agricultural change (P/PP/MF) utilises key aspects of the 'good farmer' concept, with the theory of structuration (Giddens, 1991) and identity theory as the theoretical foundations for the model (Burton & Wilson, 2006). Agricultural transitions between the three approaches of the P/PP/MF model are temporally non-linear (post-productivism is not always the next sequential step and does not necessarily replace productivism), spatially heterogeneous (geographical localities are not always affected in the same way by transitions) and complex (Wilson, 2008). For the purposes of this research project, the P/PP/MF model will be used as one of the main theoretical frameworks to determine why there has been a shift in farmer practices and whether there has been a shift in identity conceptualisation in the Hurunui-Waiau region.

Burton & Wilson (2006) investigated the conceptualisation of farmer identity and instead of simply categorising famers as 'conservationists' or 'agricultural producers', they acknowledge that "farmers

may maintain all identities simultaneously and, where the situation arises, appropriate the most suitable identity with its expression of beliefs, roles and attitudes" (Burton & Wilson, 2006, p. 103). The paper also renamed the 'traditional' group as 'agricultural producer', and 'entrepreneur' was renamed to 'diversifier' (Burton & Wilson, 2006). Under the framework laid out in Figure 2-4, the four identities within each of the three self-concepts are ranked based on their importance to the productivist, post-productivist and multifunctional identities. The identities that have "(other)" beside them may be viewed negatively by the farmer and are therefore not a part of the farmer's self-conceptualisation. In terms of the multifunctional self-concepts, farmers may differ in how they allocate priority to each of the four roles depending on their priorities as an individual (Burton & Wilson, 2006).

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Figure 2-3 Hypothetical conceptualisation of (a) productivist, (b) post-productivist and (c) multifunctional farmer self-concepts (Burton & Wilson, 2006).

The representation of identity in the Burton & Wilson (2006) model is relevant to the farmers under the AIC Environmental Collective, for example some farmers may set aside some land on their farm for riparian planting or preservation of native species and then have other parts of the farm for intensive agricultural production. However, the model only fits this case study to a point and it needs to be modified to account for case specific differences, in particular the context of EMS and an environmental auditing scheme to promote environmental practice. This study is focused on dairy

farming and water quality specific practices, whereas the Burton & Wilson (2006) model is focused on comparing a more general productivist/ non-productivist division. Furthermore, the diversifier identity is not yet relevant for farmers in the Hurunui-Waiau catchment as they have not begun adopting non-agricultural streams of income such as tourism. A modified version of the Burton & Wilson (2006) model is discussed further in Chapter 5 and 6.

2.6.5 Spectrum of multifunctionality

Wilson (2008) further explored the concept of multifunctionality and argued that it is can be viewed as a spectrum from weak to moderate to strong multifunctionality with the potential to transition between these levels on an individual farm basis. However, beyond basing the notion of multifunctionality on the simultaneous occurrence of productivist and post-productivist actions, the underlying notion of post-productivism has been challenged (Evans, Morris, & Winter, 2002) based on the suggestion that there is an "inevitable transition from one organisational state to another" (Wilson, 2008, p. 368). Instead, Wilson (2007) argued that the term non-productivism should replace the use of post-productivism as it is a better representation of the opposite of productivist action.

In terms of the spectrum of multifunctionality, Wilson (2008) argues that strong multifunctionality is the most desirable type of multifunctionality as it focused on not only environmental protection, healthy farming and community, but is also the most morally driven type of multifunctionality. For a system to be characterised as strongly multifunctional, it will have a low farming intensity and productivity, high environmental sustainability (Evans et al., 2002) and strong social, moral, economic and environmental capital, as these concepts have been defined by Bourdieu (1983). The presence of a strongly multifunctional system also indicates that there has been a significant shift in the mind-set of farmers and other stakeholder groups from the traditional productivist approach that is solely focused on maximising food and fibre production (Clark, 2003; Wilson 2008).

There are multiple decision pathways that can be taken that range between the productivist and non-productivist ends of the spectrum and there is also a range of constraints and opportunties as well as enabling and disenabling factors that influence the likelihood of a transition to strong multifunctionality occuring (Wilson, 2008). The funnel diagram in Figure 2-4 provides an analysis of constraints and opportunities for different farm types and narrows from left to right, which indicates that the pathway to strong multifunctionality is not equally accessible to all farmers.

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Figure 2-4 Multifunctionality decision-making funnel for different farm types (Wilson, 2008)

Agribusinesses are located in the bottom left corner, ranging from weak to moderate multifunctionality, and typically have a large range of enabling factors that allow transition between these two states as they are usually large, well embedded in the national agrocommodity chain and well-funded (Walford, 2003). It is possible for agribusinesses, such as the corporate run farmers under the AIC Environmental Collective, to follow strong multifunctional pathways, but it depends on the ideologies of the agribusiness owner (Wilson, 2008).

Large economically buoyant farms, such as large owner operated of family farms, are located above agribusinesses and also have a wide transitional range between the multifunctional pathways, but have more opportunity to implement strongly multifunctional systems (Wilson, 2008). Whilst there may still be a strong productivist, profit driven approach to farming, there is more ability due to the economic buoyancy of these larger and more wealthy farms to implement different non-productivist actions such as converting some land on farm to conservation areas (Wilson, 2008).

Moving to the right of the funnel diagram, lowland farms tend to follow a more productivist and weakly multifunctional pathway (Walford, 2003) whereas upland farms tend to follow more strongly multifunctional pathways as less of the land area will be suitable for intensive agricultural development, thus favouring non-productivist actions (Wilson, 2008). Whilst there is the potential for lowland farmers to pursue more strongly multifunctional pathways, it requires a shift away from

the characteristically intensive agricultural production systems with low levels of diversification (Wilson, 2008). The remaining farm types in the funnel diagram are not relevant to the types of farms that are under the AIC Environmental Collective in the Hurunui-Waiau catchment.

The multifunctionality decision pathway is also influenced by the type of farm ownership as it determines the degree of flexibility in choosing different transitional pathways (Robinson, 2014). As shown in Figure 2-5 owner occupiers (typically family farms) have the highest degree of control over which multifunctional pathway to follow and also have the greatest level of flexibility to change direction (Wilson, 2008). However, for some farms multiple family members are involved in the decision-making process and this can constrain the transitional ability of the farm if a majority consensus is needed for actions to be implemented (Wilson, 2008). In other cases, farms are held under joint-ownership, which has similar issues with inflexibility in deciding the multifunctional pathway to follow, particularly if there are differing productivist and non-productivist values between the owners (Wilson, 2008). It is also becoming more common for farms to be run under corporate or semi-corporate structures, which sees farm managers running the farm but not having ownership of the land and the decision-making processes being controlled by external decision makers (Wilson, 2008). It is still possible for tenant farmers to pursue strong multifunctional decision pathways, however it is much more challenging than it is for owner occupiers (Wilson, 2008). The majority of AIC farmers are owner occupiers and there are several instances of multi-member ownership, so most farmers under the collective have a high level of flexibility to change their multifunctional pathway.

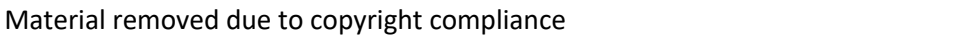

Figure 2-5 Multifunctionality decision-making funnel for different farm ownership types (Wilson, 2007, p. 278).

An EMS, such as that developed by AIC "occupies an intermediate regulatory space in working within the dominant productivist agricultural system, while at the same time seeking to address and 'green' the negative externalities created by this system of production" (Higgins et al., 2008, p. 19). Under the AIC ISMP, farmers that have signed up to the collective are required to adjust their management practices to meet the environmental targets set under the FEP (Rutherford, 2017). Therefore it is a requirement for farmers to adopt more 'conservationist' behaviours in order to comply with the scheme requirements (Burton & Wilson, 2006). The expectation associated with this requirement would be for the farmers to be following stronger multifunctional pathways. In addition, one aspect of the FEP administered by AIC is the use of OVERSEER as a scenario planning tool, which allows the farmer to identify the paddocks that are contributing most to negative environmental externalities (A. Rutherford, personal communication, March 9, 2018). This is an enabling tool for the multifunctional approach, whereby farmers can separate different areas of their land for productivist and non-productivist behaviour to maximise production within the environmental constraints set under the FEP (Wilson, 2008).

The Burton & Wilson (2006) conceptualisation of farmer self-concept will provide the theoretical framework to determine whether farmers under the AIC scheme have altered their self-concept and changed their perception of what defines a 'good farmer' following the introduction of an audited environmental management system. The decision-making funnels that were developed by Wilson (2008) will be used to determine which multifunctional pathway farmers have taken and the influencing factors in the decision-making process. (Smith, 2015; Thomas, 2011)

Chapter 3

Methodology

3.1 Introduction

This chapter outlines the research questions for this study, the research design for carrying out the semi-structured interviews, data collection and analysis processes and the potential sources of bias for the study methods.

3.2 Research aim and research questions

In order to determine if there has been a change in farmer identity associated with the change in management practices under the AIC Environmental Collective scheme and to identify the main drivers behind the change, the study focused on the following key research questions:

1. Since the introduction of the AIC Environmental Collective has there been a shift in farmer attitudes and self-concepts that align with a shift in farmer identity towards non-productivism or multifunctionality? If yes, what have been the main drivers of this change in attitude and self-concept?

2. If there has been a shift in farmer identity under the collective scheme, is there a difference in the shift in identity between farmers that started at an A grade, farmers that improved and static farmers?

3. What has the overall effect of the AIC Environmental Collective been on the environmental sustainability of farming practices in the Hurunui-Waiau?

3.3 Research design

AIC was one of the first irrigation groups in Canterbury to be developing a programme based on audited self-management. Alastair Rutherford, who is the environmental manager for AIC, and Ronlyn Duncan (previously a lecturer at Lincoln University) shared an interest in what impact audited self-management might be having on farmer practices and attitudes and wanted to see if a student would be interested in conducting research on changing farmer attitudes identity within the AIC scheme. The research project fitted within my research interests as I am from an agricultural background and am interested in what motivates behavioural change within the farming community, particularly in regards to adopting more environmentally friendly practices.

To investigate farmer identity in the Hurunui-Waiau region in relation to the P/PP/MF agricultural change model, a qualitative research approach was utilised through a series of semi-structured interviews with a combined total of 17 farmers and stakeholders. As this study was focused specifically on the AIC collective, a case study methodology was an appropriate choice, particularly as the research aimed to understand how and why a phenomenon has occurred within the bounds of a complex social system (Smith, 2015; Thomas, 2011).

3.4 Sample selection

There are currently 160 shareholders and 32 private non-AIC shareholders signed up to the AIC scheme, which represented the pool of potential candidates for the interview process. The following farm types fall under the AIC scheme: sheep and beef, dairy, dairy support, sheep, beef and arable/dairy support (Rutherford, 2017). This study limited its focus to dairy farmers to reduce the number of variables being considered and also because the catchment predominantly consists of dairy farmers. The initial group of nine farmers selected to participate in the study was identified by Mr Rutherford, as he conducted the initial round of audits and therefore had the most up-to-date knowledge on farmers that would be interested in participating in the study. This initial group represented the following three categories to reflect the demographics of the AIC collective:

1. Started at an 'A' grade
2. Improvers that shifted from 'C' to 'A' grade, 'C' to 'B' grade or 'B' to 'A' grade
3. Static farmers that have stayed at 'B' or 'C' grade

In the initial round of interviews a total of three participants were selected for group one, three participants for group two and three participants for group three. To reduce sampling bias, the farmers identified by Alastair were then asked to identify other farmers under the AIC collective with differing perceptions towards the changes in farming practices in alignment using the snowballing methodology (Araujo & Bramwell, 1999); however none of the initial farmers put suggestions forward. Therefore, AIC were asked to provide a larger list of the farmers under the scheme and information on each candidate and the remaining participants were selected from this list. In total, three participants were selected that started an A grade, six participants were selected from the improvers group and three participants were chosen from the static group.

Table 3-1 below outlines the categories each of the farmers fell under.

Table 3-1 Interview group categories for farmer interviewees

Farm #	Group
Farm 1	Improvers
Farm 2	Started at an A grade
Farm 3	Started at an A grade
Farm 4	Static
Farm 5	Started at an A grade
Farm 6	Static
Farm 7	Improvers
Farm 8	Improvers
Farm 9	Improvers
Farm 10	Improvers
Farm 11	Improvers
Farm 12	Static

For some of the interviews, more than one person was present as there were multiple people involved in the decision-making process for the farm that wanted to be part of the interview process. For Farm 1, Farm 4 and Farm 6 two people were interviewed, giving a total of 15 people involved in the 12 farm interviews.

Stakeholder participants were selected based on advice from Ken Hughey, who was an advisor for this thesis and has been involved in the Hurunui-Waiau Zone Committee for many years. Table 3-2 provides the stakeholders and the organisations they were associated with.

Table 3-2 Stakeholder interviewees

	Name	Organisation
Stakeholder 1	Ian Brown	Principal Strategy Advisor for ECAN
Stakeholder 2	David Croft	AIC Chairman
Stakeholder 3	Scott Pearson	Fish & Game
Stakeholder 4	To remain confidential	Forest & Bird

Stakeholder 5	Ron Pellow	Formerly of LUDF

3.5 Data collection

Interviews were conducted between June and August, 2018. An initial introduction with each farmer and stakeholder took place over the phone to establish contact and arrange a suitable time for a sit-down interview. Semi-structured interviews were conducted face-to-face with the selected farmers and stakeholders and recorded using voice recording software on an iPhone. The semi-structured interviews with the farmers took place at each farmer's property and were approximately one hour in length. The stakeholders were interviewed either at their workplace or at a nearby café. The shortest interview took half an hour and the longest interview lasted 90 minutes. To ensure the validity and reliability of the collected data, the interview questions followed an open-ended structure to avoid the indication that there is a 'right' answer to the question. A research summary and consent form was provided to each participant outlining their right to refrain from answering specific questions and to withdraw completely from the interview process. The farmer interviewees (and stakeholder interviewees where requested) were assured that their interview would be anonymous, to ensure their responses cannot be traced back to them. Crucially, the participants were informed that the research is external to AIC and was being conducted by an external observer. The goal was to minimise or ideally avoid the farmers altering their responses based on what they think the researcher or the AIC management board wants to hear.

3.6 Data management

Once each interview had been completed, the recording from the iPhone was transferred to a laptop and then a backup copy was uploaded to OneDrive to ensure the data was not lost. The identity of each farmer is not evident in the file name to ensure anonymity is preserved and access to the interview files is password protected. The supervisory team also has access to the data to ensure the accuracy of the data analysis process. Following the backup process, the interviews were transcribed into typed written transcripts that the farmer could request to access to confirm that the interview accurately represented their position. These transcripts have also been backed-up using OneDrive.

3.7 Data analysis

To determine if farmer identity has changed under the AIC collective scheme, a thematic discourse analysis was conducted. There is a highly diverse range of complex qualitative analysis approaches,

however thematic analysis is considered to be the foundational methodology for qualitative analysis (Braun & Clarke, 2006; Holloway & Todres, 2003). Thematic analysis involves "identifying, analysing, and reporting patterns (themes) within data" and is often used to interpret different aspects of the research topic (Boyatzis, 1998; Braun & Clarke, 2006).

A key aspect of thematic analysis is that it is not bound to any pre-existing theoretical frameworks and can therefore be used within a wide range of them (Braun & Clarke, 2006). For this research project a 'contextualist' thematic analysis method was utilised as it acknowledges "the ways individuals make meaning of their experience, and, in turn, the ways the broader social context impinges on these meanings, while retaining focus on the material and other limits of reality" (Willig, 1999, p. 38).

As this research project is investigating an under-researched area, where farmers' views on the potential shift in conceptualisation of the 'good farmer concept' is not known, a rich thematic description of the entire data set was produced. This approach allows the reader to understand the predominant themes that have emerged and thus the themes need to be an accurate reflection of the content of the data set as a whole (Braun & Clarke, 2006; Patton, 1990). Themes were identified by following the six phases of thematic analysis and were driven by inductive analysis, which is a data-driven, bottom-up approach (Table 3-3). Manual sorting and NVivo was used to sort and code the data, as well as to identify the important themes from the interviews. The anonymity of the farmers was preserved during this process by referring to each farmer by a number (e.g. farmer 1) that was randomly assigned.

Table 3-3 Phases of thematic analysis (Braun & Clarke, 2006).

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While the data was collected via interviews designed specifically for this research project, the themes were not necessarily related to the specific questions that the farmers were asked and were not fully driven by the theoretical interest of the researcher (Braun & Clarke, 2006). Consequently, inductive analysis allows the researcher to code the data "without trying to fit it into a pre-existing coding frame or the researcher's analytic preconceptions" (Braun & Clarke, 2006). The thematic analysis was conducted at the latent level, which extends beyond the semantic content (surface meanings of the data) and "starts to identify or examine the underlying ideas, assumptions, and conceptualisations - and ideologies - that are theorised as shaping or informing the semantic content of the data" (Braun & Clarke, 2006). The P/PP/MF model and the underpinning theories (theory of structuration and identity theory) are the frameworks used to examine the underlying ideas of the collected data.

3.8 Researcher bias and assumptions

As acknowledged by Ely, Anzul, Vinz, & Downing (1997, pp. 205-206) "If themes 'reside' anywhere, they reside in our heads from our thinking about our data and creating links as we understand them". It is not possible for a researcher to approach a topic in a completely unbiased manner and thus they must identify the potential sources of bias that may drive the direction of the research project.

This researcher grew up on a sheep and beef farm in South Otago, but has also completed a Bachelor of Science in Conservation and Ecology and therefore has an understanding of both the farming perspective and environmentalist perspective. As a result of my background, I sympathise with the tenuous economic condition of farming but also recognise the how critical it is for farmers to perform well environmentally. Someone with a stronger environmentalist or productionist perspective may interpret the data in a different manner. In my findings I am more likely to reflect on my understanding of what is practicable for farmers to achieve rather than what is absolutely necessary for environmental objectives and to sympathise with farmer resistance to certain forms of regulation, such as the use of OVERSEER as a regulatory tool.

The current hypothesis is that there has been a shift in farmer identity towards a more multi-functional approach where productivist and post-productivist approaches occur simultaneously both temporally and spatially. This will not be reflected by all farmers, but there has been a significant overall improvement in FEP audit grades under the AIC collective scheme.

The aim of this research is to identify why there have been such rapid changes in farming practices following the introduction of the AIC scheme and if there have been any associated flow on effects on farmer identity and conceptualisation of what is a 'good farmer'.

Chapter 4

Results: Drivers of environmental practice

4.1 Introduction

This chapter is the first part of the results section and explores the drivers of environmental practice as identified by the farmers and the extent to which these conform with stakeholder perspectives. The chapter focuses on the following drivers that influence the uptake of environmental practices on farm: regulatory drivers, institutional drivers, environmental drivers, social drivers and technological drivers.

4.2 Regulatory Drivers

4.2.1 AIC management in comparison to ECAN management

The majority of farmers prefer being managed by the AIC Environmental Collective as opposed to ECAN because AIC is a locally driven organisation and they feel that communication is much easier and more open than it was with ECAN. The farmers' comparison of regulation implemented by AIC and ECAN was very similar amongst the three farmer types, with the consensus being that management is much stricter under AIC, as AIC has higher expectations of what it wants farmers to deliver. It was typical for farmers who had started at an A grade to distinguish between the focus of an audit conducted by AIC or by ECAN. One farmer stated the difference between the two regulatory bodies was based on the examination of practices and of outcomes: "The difference between AIC and ECAN […] is they are looking at a number and AIC is more looking at the practice" (Farm 2). For those in the improvers group, the emphasis was more frequently on the level of trust they placed in the person conducting the audit. This included differentiating between the local and more generalised knowledge, the auditor's awareness of any extenuating circumstances on farms as well as the greater potential for consistency in analysis.

> "I think it's a better thing, local solutions for a local problem. It's pretty consistent that farmers in general don't like to be told by someone from outside, but if it's something you're involved in, farmers tend to come up with the right answer. Like the Pahau [River] was effectively a sewer and now it's winning prizes; so that's just about farmers being aware of the problem and fixing it" (Farm 7).

> "ECAN didn't actually have the skills or the people to do the job properly. Their inspections were a disgrace, they would sit in the car at the dairy and tick the boxes. They just lacked the ability whereas AIC, because Alastair especially is a local, you can't hide anything. It gives you confidence in your neighbours because if you're getting thoroughly looked over, you know everyone else is. So, no one is getting a free ride." (Farm 9).

By contrast, the sense of impending threat under the audit oversight was given more emphasis within the static group. One farmer stated: "If we can manage it properly with ECAN looking over the top saying that's really good you're achieving the goals we need to see, then we're able to carry on farming without living in fear. Well not that you live in fear, but you're better off doing it and lifting the bar yourself than being told what to do." (Farm 6).

The stakeholders agreed that the AIC Environmental Collective is an influential scheme. For David Croft (AIC Chairman), having a locally run scheme provides a more effective way of solving issues in the catchment than a scheme managed at a regional level by ECAN:

> "The strength [of the AIC Environmental Collective] is it's a united approach to being able to fix the community problems."

The stakeholders from Fish & Game and Forest & Bird also agreed with the farmers that although they no longer have to report to ECAN, the expectations from AIC for farm environmental practices were much more stringent than they were under ECAN:

> "ECAN supports the collective notion and by joining the collective, you as an individual farmer get off the hook for having to report to ECAN [but] be[come] subject to a whole set of more stringent rules. So, it has changed farmer behaviour and because they [AIC] can turn the tap on or off for the water, they're very potent actors in terms of changing that farmer behaviour." (Stakeholder 4 (Forest & Bird)).

An example of a similar effort to regulate farm environmental practices is the Synlait Lead with Pride scheme, which is based in the commodity chain and is encouraging practices that align with consumer preferences. The scheme is an ISO14001 accredited scheme, therefore farmers are rewarded for meeting the scheme requirements by receiving a higher premium for their milk products. Farmers under the Lead with Pride scheme are also audited on their environmental performance, in a way that has some similarities to the AIC FEP audits. The frequency of AIC audits is determined by the grade received, whereas the Lead with Pride audits are audited on part of the four pillars (environment, animal health and welfare, social responsibility and milk quality) each year

and then a full audit occurs every three years. The value of the Lead with Pride scheme has been recognised by some of the improvers and static farmers. The improvers tended to focus more on the financial incentives of the scheme: “We'll get paid a little more yeah. The incentive now is a little bit better than it has been, the price has gone up which is why I'm looking at it, otherwise I wouldn't have worried” (Farm 10). Only one static farmer showed interest in the Lead with Pride scheme and was more concerned with the contrasting approaches between AIC and Synlait to achieve better farm environmental performance:

> “When we come to do our Lead with Pride audit in our environmental pillar, we have one set of things we have to reach and then we have to prepare pretty much the same stuff in a slightly different way for AIC for their farm audit. Ultimately both [are] trying to achieve the same thing but as we've sort of discussed, the Synlait ones are an ISO approved so it's as Alastair would put it quite tick-boxy, it's a yes or a no. Whereas the AIC one can be a bit more subjective, rightly or wrongly, so I guess it might come back to what personality type you are. But both are trying to achieve the same thing, but it means a cross-over of time and also the time frames are quite different too” (Farm 12).

Scott Pearson (Fish & Game) was supportive of the Synlait scheme, but felt that the financial incentives for farmers needed to be improved to increase farmer uptake: “long term I'd like to see Synlait pushing for earning more money out of those high value products, I'm sure they are trying.”

4.2.2 OVERSEER®

Farmers generally understand and accept the use of OVERSEER® as a scenario planning tool, which is how the tool is currently used under the HWRRP. The farmers that started at an A grade tended to be more involved in using OVERSEER® as a scenario planning tool in their farm management practices. One farmer stated: “For the environmental side we'll look at the actual amount of nitrogen leached per hectare and then probably use the blocks within OVERSEER® to identify where our riskier blocks are” (Farm 2). However, when the HWRRP is reviewed there is the possibility that ECAN could use OVERSEER® as a regulatory tool. There is concern from farmers across the three types around its use for regulatory purposes due to the high error rate of the model and the effects of model updates that can dramatically affect the N output figures. OVERSEER® is limited in its accuracy, as well as its ability to measure phosphorus leaching, which impedes the ability to effectively manage water quality in the Hurunui and Waiau rivers. One improver farmer stated: “What five years ago was acceptable and gave us a 19 kg/ha N loss, now gives us a 60 kg/ha N loss

with roughly the same system running. So you know, while they're working very hard at it and it's the only tool we've got, I don't think it's as accurate as it could be" (Farm 7). The static farmers accepted the use of OVERSEER® as an advisory tool but agreed that the accuracy of the model was not appropriate for a regulatory tool: "Well I struggle with OVERSEER®, it's a bit of a moving target. You've got different versions coming out that spit out different results and I think far too much emphasis is placed on OVERSEER® as a regulatory tool. I think it's a good advisory tool, I don't like it being used as a regulatory tool" (Farm 4).

Ian Brown (Principal Strategy Advisor for ECAN) acknowledged that there are some limitations to the OVERSEER® model and recognised that this may cause frustration for farmers, however it is the only tool that ECAN has: "My view is that OVERSEER is generally a very good model and tool, but it does have limitations and when you provide advice [taking account of] those limitations, it works pretty well." Scott Pearson (Fish & Game) was supportive of the use of OVERSEER® only as an advisory tool under the HWRRP due to the limitations of the model: "I still like the fact that we still have load levels and we're not totally reliant on OVERSEER on farm. So, I think we need both. Yeah I actually think long term we're going to need to go, unless OVERSEER can be drastically improved, we're going to need to look at some input controls on I guess like looking at things like what is the carrying capacity of the catchment in term of the total number of cows, looking at the amount of fertiliser in that catchment and sort of putting some caps on it and trying to get some of these collective schemes to manage within that allotment."

4.3 Institutional Drivers

4.3.1 Effect of grading system on farm management practices

Having to make changes to farm management practices has been a significant adjustment for some of the farmers, who were initially reluctant to engage with the changes but have since fully engaged in the challenges of meeting the audit requirements. One improver farmer stated: "It's been an eye-opener, put it that way. It's a matter of knowing what they're after and what they're trying to achieve, that's what I find. It's probably been difficult in a way, but once you understand the modelling then it becomes quite easy and it's actually quite good to try and progress on it" (Farm 10).

The main areas that the improvers and static farmers need to work on is around irrigation efficiency and effluent storage. One improver farmer stated: "the only reason we can't go to an A, we've got to a B, is the fact that we don't have enough effluent storage but yet we still comply with ECAN who are very happy with [our] effluent storage, but AIC want more" (Farm 1). Upgrading effluent storage

is a large financial cost and is therefore one of the biggest obstacles for farmers to get an A grade under the audit scheme at the moment.

The farmers within the static group and the improvers group were all working towards reaching an A grade but weren't quite there yet. One static farmer stated: "We're classed as a B and we're not too far off an A, it's just some of our old irrigation and our sprinklers" (Farm 4). However, one of the static farmers expressed frustration because he had made a lot of changes to his farming practices, but this is not reflected in the auditing grade as he has not quite fulfilled the requirements for an A grade. He stated: "you're heading in the right direction, doing the right stuff from one audit to the other and then you're still in the same position from a grade perspective when you're actually further ahead from an environmental point of view" (Farm 12).

For some improver and static farmers, there were not many changes that needed to be made to farm practices and instead the main issues were related to the correct documentation and recording of information. One of the improver farmers stated: "A lot of the stuff we didn't really change all that much what you did, but now you have to write down and give guidelines on what you do and how you do it and invest in technology, so you can prove what you do" (Farm 8).

Those that started at an A grade didn't have to change any of their practices to comply with the AIC FEPs. One farmer stated: "I think what we were doing was pretty much within the boundaries of what was okay. We haven't done anything too drastic. It just makes you a bit more aware of how much nitrogen you're putting on, how much feed you're putting into the system" (Farm 3).

Concern was raised by Fish & Game and Forest & Bird that the enforcement of GMP is not ambitious enough and AIC should be pushing towards best management practice if water quality is going to improve in the catchment, particularly if farmers have not needed to make many or any changes to management practices to reach GMP. Scott Pearson (Fish & Game) stated: "I still think it's ultimately about minimum standards, so they're (AIC) trying to bring up a lot of the farms that are in that lowest or middle quartile. What we really need is for them to be working with their top quartile and saying how can we drive innovation; how can we bring everyone with us."

4.3.2 Influence of AIC in the Hurunui-Waiau catchment

AIC has become a powerful organisation within the catchment, particularly with their ability to turn off water to farmers if they don't comply with their FEPs, so they have been able to influence the behaviour of farmers to ensure better environmental practices are followed. Ian Brown (ECAN) stated: "An environmental strategy was put together and they're essentially following their

environmental management strategy and I think they're doing a good job and the good job will ultimately tell whether the farmers are moving towards better grades and certainly the results in the last twelve months have shown that farmers are moving up the grades."

Farmers across all three farm types thought that the catchment was on its way to becoming environmentally sustainable and they just need to keep building on what they are already doing. One farmer that started at an A grade stated: "I think we've just got to keep on pressing on and keep doing what we're doing. We'll just get these audit procedures in place, my guess is - and I think the numbers support this - that the bulk of our guys are running As and Bs, and the few Cs are probably not too far away from getting themselves together" (Farm 3). Similarly, an improver farmer stated: "A lot more of what we're doing, just being prudent, fencing waterways and the science needs to help us in terms of better science to help us be more targeted with our fertiliser, all of the above. I don't think it's not sustainable now, so just more of the same really" (Farm 7). A static farmer also stated: "I don't think there's too many individuals that need more pushing. As a group, people are moving forward" (Farm 12). However, David Croft (AIC Chairman) acknowledged that there is still plenty of work left to do. He stated: "We've got quite a bit of work to do, even though we are working under, well AIC has got a discharge load, we've still got quite a bit of work to do within our members to lower nitrogen emissions from the farm. Our water testing has shown some quite high nitrate levels around the area."

AIC are also able to be strong advocates to protect the interests of their shareholders. One improver farmer stated: "But one of the advantages of farming here and one of the reasons farms are sought after is because of that very strong advocacy" (Farm 9). However, there was some concern raised by several farmers across the three farm types as well as the environmental NGO's around the grandparenting of nutrient load and the impact that has on other groups in the community, in particular the dryland farmers, as it dictates who is and is not able to develop further. Scott Pearson (Fish & Game) stated: "they're so big and powerful in the catchment that they tend to defend and look after their own very strongly, so in other words they've claimed that large share of nutrient load and they've grand-parented that so it means that other parties, such as dryland famers, have very little room to manoeuvre, so I think that's a problem. They're such a big conglomerate within the catchment that they kind of [are] a bit resistant to change."

One farmer that started at an A grade questioned the ability of the AIC board, which is run by farmers that are part of the catchment, to remain unbiased in ensuring that an equitable outcome is reached for all the stakeholders in the community. They stated: "But you've got a bunch of farmers that live in that community who sit on the board of Amuri Irrigation and they've got a little bit of

headroom say for nitrogen and… sometimes you can repress your stocking rate or someone may have an increased nitrate loss from a particular area of land. How do they govern that in a way that's getting the best outcome, equitably for all the stakeholders in that community. Is it first in, first served? So again, going back to my point earlier if you've got two farms side by side and one's got a less leaky soil than the one next door, but the leaky soil farm applies first and gobbles up all the nitrate capacity well that's probably the wrong thing to be doing" (Farm 5). An improver farmer voiced similar concerns: "I do think that AIC is quite powerful now in being judge, jury and executioner over which farmer can do what and for whatever reason. So, I think that it's, I don't know how you'd change it, but I think they're kind of I'm not sure if that's kind of right" (Farm 8).

4.4 Environmental Drivers

While there has been an increase in the influence of environmental drivers on farm decision making processes, there was a greater emphasis on environmental drivers from the stakeholders (primarily Fish & Game and Forest & Bird) than from the farmers. Within each of the three farmer types there were some farmers that saw the importance of environmental drivers and some that were not concerned. Generally, the increase in farmer awareness of environmental drivers has been because of increased publicity and inclusion of environmental targets in AIC requirements following the shift from ECAN management to AIC management. How environmental awareness has changed is discussed further in section 5.2.

4.4.1 Water quality

Water quality is the most important environmental driver for both farmers and stakeholders in the Hurunui-Waiau catchment. The focus of the changes to farm environmental practices are centred around reducing nutrient loss into the Hurunui and Waiau rivers, as well as their tributaries. In complying with the FEP audits conducted by AIC, all of the farmers that were interviewed have shifted away from border dyke irrigation, fenced off and completed riparian planting and are either moving towards or already following GMP. Farmers across all three types expressed a desire to have healthy, swimmable waterways in the catchment. One farmer stated: "I don't think we should be polluting the rivers. I mean, you can't get over the fact we're going to take water out of one river and then one way or another a lot of that is going to end up in the next river. But we should be making some reasonable efforts" (Farm 3).

Despite the progress that has been made by improving farm management practices, concern has been raised mainly by the environmental NGO's, but also by some farmers, around the further expansion of irrigated land in the catchment and the effect that is going to have on the rivers. One of

the improver farmers stated that: “Right, and then they've sold 5000 more hectares of irrigation so are we actually going to improve the waterways or are we just maintaining them how they were. Like I say, 30 000 hectares and we've made some improvements and they've put in the pipe scheme, so we have more water, so they've sourced another 5000 hectares. So, after when we started there was so much crap in the water and we've made improvements, which we have, but we also sold an additional 5000 hectares which is a lot. So, are we actually going to improve the water?” (Farm 8).

The catchment is already over-allocated for phosphorus concentrations and there is still further development and expansion of irrigated land planned for the Hurunui-Waiau, in particular the HWP. The Fish & Game and Forest & Bird representatives on the Zone Committee are highly concerned about water quality issues and feel that while some environmental actions have been taken, it will not be enough to offset the increased environmental impacts from increased development that has been proposed for that catchment. Scott Pearson (Fish & Game) stated:

> “If the nitrogen concentrations increase by 0.2 or 0.4, we might start seeing more cyanobacteria around the Waiau changing some of the swimming spots and fishing spots and those sorts of things. So not as bad as the Hurunui but the E. coli levels are quite high in some spots, so water quality has been an issue there and there is still some periphyton and things like that particularly in the height of summer… It's trying to avoid the perfect growing conditions for algae and periphyton. I guess you'd say Waiau is not as bad but it's definitely potentially at a tipping point if we have more development and it could see it go downhill quite quickly.”

The Forest and Bird representative also stated:

> “Last time they (AIC) freely shared a report was the 2014 data and at that time Hurunui Waiau was using only about 56% of their consented water so we're having the effects we're seeing right now with only just over half the water being utilised, but we're consented to use almost 50% more water so what kind of effects are we really going to be seeing?”

4.4.2 Stocking rates and intensification

There is an increased awareness of the negative environmental impacts of high intensity farming practices, such as high stocking rates, within the catchment. In recognition of the environmental impacts, some farmers have started to reduce their stocking rates, which is a non-productivist action. The farmers that started at an A grade had all begun reducing their stocking rates in recognition of the need to reduce their environmental footprints. One farmer stated: “We're looking

to milk about 700 to 720 cows this coming season. So, we've sort of pulled our calving numbers back, when we first bought the farm we were milking about 800 cows, but we've reduced the stocking rate" (Farm 5). Only some of the improver and static farmers had reduced their stocking rates, which tended to be because they were focusing on improving other areas of their farm management practices to meet the requirements of their FEPs. One of the improvers that had reduced their stocking rate stated: "I disagree with a lot of the intensive farms on this sort of country where stocking rates are in the [range of] five cows to a hectare on light soils because nutrient loss is linked to cows per hectare, especially if you're a very high input farm with a very high stocking rate, your nutrient loss on light soils is ridiculous. I have all sorts of problems with that. I actually feel that we're at the moment with a moderate stocking rate on a dairy suitable soil probably about as good as anyone and I'm happy to have that discussion" (Farm 9).

The Lincoln University Dairy Farm (LUDF) has conducted research into reducing their environmental footprint while maintaining productivity and have successfully managed to achieve this by reducing their stocking rate to better match feed supply. Ron Pellow (formerly the manager of LUDF) stated that this research can be transferred and used by dairy farms within the Hurunui-Waiau to lower the environmental footprint of farming in the catchment (see figure 4.1). Whilst some farmers under the scheme are slowly reducing their stocking rates, it is not currently a priority for AIC and the research from LUDF has not been pushed out to farmers within the collective. Ron Pellow commented that for a lot of farmers that he had worked with, uptake of environmental practices was driven by the impact of falling milk prices because it was a cost saving opportunity. This was not mentioned by any of the farmers that were interviewed as a motivational driver for shifting farm practices.

The two environmental NGO's felt strongly that the stocking rates in the Hurunui-Waiau catchment were too high and not sustainable. Scott Pearson (Fish & Game) stated:

> "it's pretty high now - it's probably 3.8, some of them are up to 4.5 cows per hectare which is incredibly high and not very sustainable. Basically, the problem is when you have stocking levels at that height, good management practices aren't going to make any difference."

They also felt strongly that AIC needs to do more in this area to encourage farmers to reduce their stocking rates:

> "AIC has the money to invest in trialling these things but at the moment I don't think they really are doing enough. I think they're putting money into good management practice and saying that determines your grade, but they haven't really gone beyond that. It's disappointing because they have the resources to do it" (Scott Pearson).

Ron Pellow (formerly the manager of LUDF):

"There's one rider to the whole conversation and that is if in doing that we ultimately farm less land because we've got less cows grazing in the winter, less young stock grazing, suddenly there's a piece of land that we used to farm that we don't need any more and that land has to be used for low nitrogen loss, highly profitable land use or else we're no better off at a catchment level. If that land gets some more cows from someone else, then the milking platform is better but the whole catchment hasn't changed very much because there's more cows."

"We reduced our nitrogen fertiliser by nearly half, not that that directly is a big factor. We reduced our imported feed by a similar portion and again that's actually not the big driver. The big driver was when we reduced the number of cows and therefore the number of urine patches across the season while maintaining the milk going out."

"We didn't have good research that we could say 'if we use it in this way we'll get this outcome, if we use it in that way, we'll get that outcome, so what if we do some of that and some of that and we think this will work'… So we simply had to say, we've now got a small amount of nitrogen fertiliser to use so we think we'll go with a maximum application of 25 kg N per hectare which was about 2/3 of what we put on in the past and we'll start it later in the spring, late winter/ early spring, and we'll make sure that we keep a chunk of it for the early autumn period of time... But farmers were looking at what we were doing with that at the same time as they were under incredible milk price pressure and having to take cost out their own business and looking and saying well Lincoln can do, maybe I can cut my nitrogen back a bit or maybe I'll miss an application. So, there was a huge overlap of the impact of milk price on interest in what we were doing from an environmental point because it was a cost saving. Actually, that's a good outcome. It encourages much higher uptake of the environmental gain because there was a financial impact."

"We've had lots of interest from farms across Canterbury, but also across the South Island and across New Zealand because at the end of the day most of the practices that we do or did or they do, now are applicable across not just dairying, but pastoral agriculture in New Zealand. We've got more efficient with nitrogen fertiliser, we've got more efficient with our stocking rates, we've got more efficient with our pasture growth and pasture harvesting and those principles apply everywhere."

Figure 4-1 Quotations from Ron Pellow in relation to the research conducted by the LUDF.

4.4.3 Biodiversity

There was a mixed response to issues surrounding biodiversity in the catchment, with farmers having varying degrees of interest in biodiversity protection. Having a strong interest in biodiversity did not correlate to membership in one of the farmer type groupings. For one farmer that started at an A grade, biodiversity preservation was driven by conservationist values: “Under the title area, there's 8 hectares of kanuka native that is under QEII covenant, so we don't touch or farm that at all. We thought it wasn't that interesting, but the experts went and looked at it and thought it was something special, so we've just fenced it off and put it under covenant” (Farm 2). Biodiversity values were highly important to one of the improver farmers who stated: “we take great pride that we've got a white heron that pops in and he's popped in every year for the past four or five years, so it's quite cool” (Farm 1).

There is not currently a requirement under the AIC FEPs regarding biodiversity (with the exception of planting riparian strips around waterways), so there is no obligation on farmers to preserve or enhance biodiversity on farm. Ian Brown (ECAN) stated: “It's not a plan requirement at the moment. There's nothing stopping Amuri Irrigation including that [biodiversity], they could include that and say that within their scheme areas it's a requirement for their shareholders.” Interest in biodiversity was found to stem from the farmer’s personal interest rather than from increased public awareness of wildlife on farms. The Forest & Bird representative argued that riparian planting is not biodiversity protection and the focus needs to be on preserving the small patches of original native plants, but this is not a priority for AIC or the farming community. They stated: “when you look at the package that they're (AIC) offering for deferring enacting the minimum flows, they're going to create wetlands, they're going to do riparian planting […] They've got a few things going on there as part of their deferral package, but a lot of the farmers are doing riparian planting, but riparian planting isn't biodiversity protection. It's so much more important that you retain those little patches over there under the macrocarpa trees... Just leave it, it's the last one on the Amuri plains. I mean the Amuri plains are shocking in terms of what's left.”

4.5 Social Drivers

4.5.1 Peer pressure from being part of a collective scheme

The majority of farmers across all three types felt that peer pressure has been generated by the scheme as they have the desire to avoid sanction by their peers for bad practice. One farmer stated: “Peer pressure is part of that because no one wants to be the guy that gets his water cut off because he hasn't done it because you have to live with your neighbours” (Farm 9). There is the additional pressure of being managed by farmers that they know who are on the AIC board, compared to regulators from ECAN with whom they have no personal relationship. One farmer stated: “For that sort of change, there is that peer pressure and with an irrigation scheme where most of the board of directors are farmers and they all see you at the pub, there is that peer pressure - it's not just the faceless ECAN, it's people they know, people they talk to openly about farming to. So that's probably the biggest advantage of a collective is if one person is not performing, either they have to perform or get kicked out of the collective because the collective has to protect everyone” (Farm 2). However, some farmers were not concerned about the opinions of other people within the catchment. There was no correlation between this trend and a particular farmer type and instead was more in relation to the personality of the farmers rather than being linked to particular grades or ownership types. One farmer stated: “No. I don't care what people think. I might not be the right person to ask that one, some people have different views to me but yeah. I am who I am and I always will be” (Farm 10).

Of the stakeholders, only David Croft (AIC Chairman) responded when asked about the influence of peer pressure as the other stakeholders did not feel that they were in a position to provide comment as they were not farmers under the scheme. He agreed with the majority of farmers that peer pressure is an influencing factor in the catchment, however David had a more positive outlook on peer pressure, particularly as it is a useful tool for AIC in influencing farmer behaviour. He stated: “So the things that motivate farmers are peer pressure and we're lucky here because we are quite a defined geographic area, so we have quite a sense of community.”

4.5.2 Public opinion and expectations of farmers

Negative public perception is a social driver for farmers across all three types to improve their farm environment practices. Farmers across all three types feel that there is a large rift between urban and rural, especially in regards to knowledge around what occurs on farm. One farmer stated: “Going forward there's less and less people involved in agriculture or have relations [who are]. Someone said to me the other day, back when we were growing up most people had a contact with

someone in the country whether it was an uncle, an aunty, grandparents or whatever and they could all shoot out there and they could be more involved with that side of it, whereas now there's less and less" (Farm 6).

The farmers feel the public has little to no understanding of current farming practices and how much their management practices have shifted over the last decade. One farmer stated: "I think they think that we make a lot of money and we just get given everything. I suppose that's a little bit of a gripe. They don't realise what the land costs, or how much debt you've got or anything like that" (Farm 11). All farmers expressed frustration that they do not get any credit for the good work they do, especially in light of all the changes to farm management practices that have been made in recent years. One farmer stated: "There's a lot of good that happens that farmers don't get credit for" (Farm 2).

Frustration was also expressed by some farmers around the public demanding sustainably and ethically produced goods, but then not being willing to pay for it at the supermarket. One farmer stated: "I think the general public needs to talk to more dairy farmers, I don't know what they want. They want to not see pictures of bad stuff, but they want the cheapest possible food. The caged egg thing is case and point, people are really unhappy, but they buy the cheapest eggs they can get so what people want and what they do are two different things."

Ian Brown (ECAN) could understand why the public has a negative perception of dairy farmers. He stated: "in my view, the public go on what they hear. If someone's not telling them, you can't blame them. You only need one bad farm and it tars a hundred good farms." David Croft (AIC Chairman) also understand why there was negative public perception, however he felt that dairy farmers had already been held to account and it is time to move forward from this. He stated: "I think what they expect is an improvement. To be honest I'm not particularly proud of where the farming industry was in the 90s. We had some pretty bad habits. It was all about expansion at all cost and bugger the environment. We just didn't care, we weren't made aware of it. We didn't care because we didn't know. We didn't care, probably not because we wanted to deliberately vandalise the environment, we just didn't know what we were doing. I think we have been held to account."

4.6 Technological drivers

4.6.1 Irrigation practices

Irrigation practices have shifted away from border dyke to spray irrigation with farmers across all three types changing their practices. When border dyke irrigation was installed, it was considered to

be the best technology at the time and the environmental impacts of border dyke irrigation were not realised until a few years later. One farmer stated: “We probably went through 15 years of border dyke dairying without really realising what was going on. I mean it did come as a bit of a surprise to me that what I was doing up there, was affecting things down where the Hurunui runs into the gorge. But we've got past that and everybody is sort of aware of that now” (Farm 3). Border dyke irrigation has slowly been phased out throughout the catchment and all have been converted to spray. Spray irrigation has been associated with an increase in efficiency of grass production, so has been favoured by farmers across the three types as there is a production gain as well as an environmental benefit. One farmer stated: “we were aware that border dyke irrigation is inefficient because one day you've got capacity and the next day it's dropped through the stones and there's nothing there” (Farm 6).

Ian Brown (ECAN) recognised that there has been a significant reduction in phosphorus levels in the catchment since the shift away from border dyke irrigation: “The Hurunui was quite high when you look at phosphorus levels, it was quite [high] in phosphorus 10-15 years ago. The prime cause of that was identified to be irrigation run-off from border dyke by-wash. That was tackled by the group called the Pahau Enhancement Group at that stage and they put in ways of containing their by-wash. That had quite a dramatic impact.” However, Ron Pellow explained that there is room for further reducing run-off by moving to short return interval irrigation systems: “We need to move away from long return interval irrigation systems to short return interval irrigation systems. So, K lines and hand shift sprinklers on their own [are] okay if you've got short return interval and irrigating accordingly.”

4.6.2 Development and adoption of new technology

Farmers across all three types are trying to adapt and keep up with technological advances, and acknowledge that technology can be a useful tool for keeping ahead environmentally. One farmer stated: “There's an ongoing evolution of understanding about how we can adapt technology to mitigate our environmental footprint and also still make money out of it. I think we'll continue to evolve, there will continue to be other inventions, so with that comes investment, comes developing” (Farm 5). In recognition of how quickly technology is moving, one farmer stated: “The only thing we've got outstanding is the effluent storage and the reason I haven't upgraded isn't actually money, it's because technology is actually moving quite fast in that area. We're looking at biogas and possibly nutrient absorption, you can do planting for that. I just think a big pond full of waste is just a short-term ugly solution, I've held off because there are some more elegant solutions that can be a win-win. I'd like to spend that money and get something out of it, even if it's just an area that looks great and we've decided to do nutrient traps or we've possibly biogas” (Farm 9).

However, technological development is occurring so rapidly it can be hard, particularly for the improver and static farmers, to keep up. One static farmer stated that: “It's moved really fast, really quickly. So, everybody is struggling to keep up because your knowledge is building all the time, technology is building all the time, expectations are building all the time so you're getting squashed from all directions” (Farm 6).

Several stakeholders highlighted the need for farms, both demonstration and commercial, to agree to be early adopters for new technology and the need for financial support/incentives to encourage farmers to take risks on incorporating new and innovative technologies and management practices on farm. It is an area of opportunity for the AIC Environmental Collective that has yet to be focused on. Ron Pellow (LUDF) stated: “I think we need really sound research, we need some demonstration farms or commercial farms that are willing to be early adopters of the research and pick it up and work with it, and what we've got to our huge advantage in New Zealand is a very co-operative industry.” Similarly, Scott Pearson (Fish & Game) stated: “Well even if it's 20% of […] farms that's converted in the area and they basically do a safety net for those farms, and say if you lose a lot of money for that trial over the next two to three years, we'll cover you as a collective, we will subsidise you and maybe the government should come in there as well and say look we've helped others. If they can be a lot more innovative and work with those leading farmers that are willing to trial things, we could make a lot more progress a lot faster and then spread that out across the whole area.”

4.7 Chapter summary

Overall, there were several areas where farmers across all three types had consistent responses to the regulation of environmental practice and the associated drivers. In relation to the regulatory drivers, it was unanimous that the shift from ECAN management to AIC management had been beneficial for improving environmental practices. Farmers also preferred the use of OVERSEER® as a scenario planning tool instead of as a regulatory tool. The response to institutional drivers was less consistent, however farmers across all types agreed that the Hurunui-Waiau catchment was on the right path to becoming environmentally sustainable because of the AIC Environmental Collective. Furthermore, all farmers and stakeholders agreed that improving water quality was the most important environmental driver for the catchment. Biodiversity protection had a much lower priority for farmers and some stakeholders, with the exception of Forest & Bird and Fish & Game. In terms of technological drivers, all farmers have shifted away from border dyke irrigation to more efficient irrigation types, namely spray irrigation. This was strongly influenced by the beneficial

impacts on the efficiency of grass growth. The findings in this chapter also indicate the importance of the introduction of environmentally targeted technology for increasing the benefits to productivity. If there are no benefits to productivity or farming returns then adoption of new environmental technology is much slower.

The main differences between the three farm types were the effects of grading on farm management practices, stocking rates and adoption of new technology. Farmers that started at an A grade did not have to make any changes to their farm management practices, whereas both the static and improver farmers had to make some adjustments to their documentation systems, effluent storage systems and irrigation practices. It was also observed that all farmers that started at an A grade had begun reducing their stocking rate, but only a few farmers from the improver and static categories had made reductions. In regards to the adoption of new technology, the improver and static farmers generally found it more difficult to keep up with the speed of technological development than the farmers that started at an A grade.

In regards to the stakeholders, the environmental NGOs recognised that progress has been made in improving farm environmental practices since the introduction of the AIC Environmental Collective. However, they are concerned that not enough is being done to address water quality and wider environmental issues in the catchment. Ron Pellow (LUDF) supported the notion that the research that has been generated by LUDF can help to further reduce the environmental footprint of farming in the catchment. He also wanted to see more emphasis on the development and adoption of new technologies on farm. David Croft (AIC Chairman) and Ian Brown (ECAN) acknowledged that while AIC has achieved a lot of positive progress over the past few years, there is still a lot to be done to improve water quality and environmental practices in general in the catchment.

Chapter 5

Results: Farmer Identity

5.1 Introduction

This results chapter is focused on farmer identity and investigates whether there has been a shift away from the traditional productivist approach to non-productivism or multifunctionality. The first part of the chapter explores how farming practices have shifted over the past few decades as well as the current mind-set towards environmental practices. The middle section is a farm-by-farm analysis of farmer identity and identifies where each farmer sits on the spectrum of multifunctionality. To conclude the chapter, there is then a section exploring the impact of the audit grade on the sense of being a good farmer as well as the public perception towards farming.

5.2 Historical farming practices and mind-set changes

Farmers across the three types acknowledge that farming practices and ideas surrounding the acceptability of certain farming practices in terms of environmental impacts, animal welfare and welfare of farm workers have shifted significantly over the past few decades. One farmer stated: "I'm in my 50s but the people working for me are from mid-20s to 40s, they're a different generation and they don't accept the stuff that was okay when I was their age. Around environmental stuff, they live in the same world as you [the interviewer] do; they read all the stuff. They wouldn't put up with me putting the effluent into the creek or anything like that. When I was much younger, when I was starting out all those things happened, and they happened on half of the farms" (Farm 9). One farmer that started at an A grade acknowledged that if environmental regulations had been stricter in the past, a lot of the issues that farmers are currently facing would not be as severe. He stated: "I was a rural banker for a quarter of a century, lent lots of money to North Island dairy farmers moving to the South Island to start dairy farms. If we'd had a few more checks and balances in place then and known more about our environmental footprint was likely to be, less mistakes would have been made" (Farm 5).

There is much more awareness across all three farm types around the effects that farmers can have on the environment, and farming practices have changed as a result to reflect that new understanding. This has been driven in part by changes in external pressures on acceptable practices. One farmer stated: "What's happening now, though, that will actually be almost compliance tomorrow; so it's staying ahead of what's going to happen as well" (Farm 12). Change

has also been driven by emerging awareness of environmental impacts of farming practices amongst farmers. One farmer stated: “It used to be you put 400 units of N on because it grew lots of grass and made lots of profit. I think it's a testament to the adaptability of farmers that as you become aware of the effects, you make changes to your system to mitigate those effects” (Farm 7). Similarly another farmer stated that you need to: “[…] be farming for the constraints of the farm. Some farms are wetter, some farms are drier. It's looking at, so if it is wet, not wintering a lot of cows on there because it's heavy and there's going to be a lot of soil damage. If it's dry, it's looking to improve the irrigation systems so it's the most efficient way” (Farm 2).

Farmers across all three types agreed that there has been an overall mind-set shift towards environmental practices in the catchment, particularly over the last five years, with a far greater awareness now around environmental issues than in previous decades. The largest shift has been amongst the improver farmers, followed by the static farmers. One improver farmer stated: “I know a lot of farmers, and even we were the same to start with, were thinking 'well what the hell is going on here' but if we hadn't [changed] then we'd be dead. We wouldn't be farming” (Farm 1). The static and improver farmers have accepted that this is the direction in which farming is going and that they need to keep up with the changes and keep adapting otherwise there will be implications for them down the track. This mindset shift has created a context within which farmers are also changing their understanding of how you need to farm to be considered a good farmer. One static farmer stated: “Five years ago, I would have said no, we'll just tell them (AIC) to go and get stuffed. But I think there's a far greater understanding and acknowledgement of not just the environmental implications but [of] the marketplace” (Farm 4).

The shift in mindset towards environmental practices was also recognised by the environmental NGO’s. It was stated by the Forest & Bird representative that: “The farming community has come a long way in the last five years from ‘absolutely not’ to ‘yeah we need to move in a different direction and I'm doing these things now’ and well done to them.”

5.3 Farming identities

The following section looks at each individual farm and explores the self-conceptualisation that the farmer(s) expressed in the semi-structured interviews based on the Burton & Wilson (2006) P/PP/MF model and the four associated identities (agricultural producer, agribusiness person, conservationist and entrepreneur). Based on the interview responses, the analytical lens for the multifunctionality role has been restricted to determining the extent to which environmental practices are incorporated within the core values or drivers of farm management. Multifunctional

factors such as tourism and diversification of income streams are not addressed due to the lack of non-agricultural activities on farms within the Hurunui-Waiau catchment.

The determination of the identity (or identities) that best described the self-conceptualisation of each farmer was based on the analysis of the following factors:

(1) motivational drivers for each farmer to change or maintain their environmental practices;

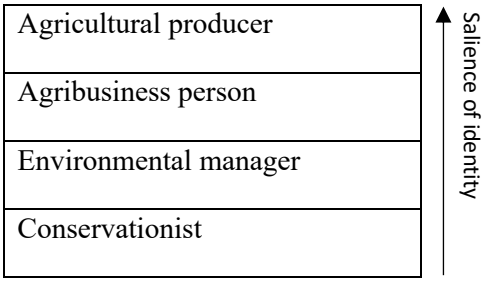
(2) their mind-set toward environmental stewardship;

(3) the targets and outcomes used to determine if it has been a good year for the farm.

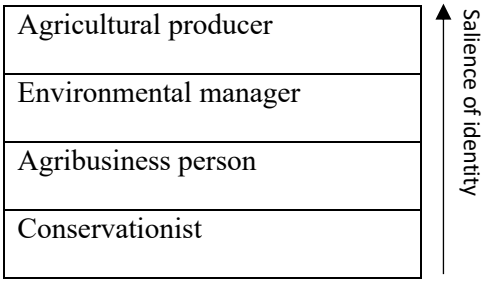
Interview responses were also used to classify where on the spectrum of multifunctionality each of the farmers is currently sitting. A holistic approach was taken to determine the multifunctional pathway that each farmer was following and therefore considered the type of farm ownership, farmer identity, the intensity of the farming operation, the shifts in farm environment practices as well as the adoption of new technology and research. All farmers were assessed as being multifunctional to some degree, with two farms following a weak to moderate multifunctional pathway (Farm 4 and Farm 8), eight following a moderate pathway (Farm 1, Farm 2, Farm 3, Farm 5, Farm 6, Farm 7, Farm 10 and Farm 12) and two following a moderate-strong pathway (Farm 9 and Farm 11).

Whilst all of the farmers are placed on the multifunctional spectrum, the motivational drivers for the environmental behaviours of the farmers following each multifunctional pathway varied. Due to the EMS and auditing process context for this study, the 'environmental manager' identity has been introduced as a more relevant identity for the farmers that were interviewed instead of following the original P/PP/MF model (Burton & Wilson, 2006). The farmers have been grouped into the following three categories according to similarities in self-conceptualisation:

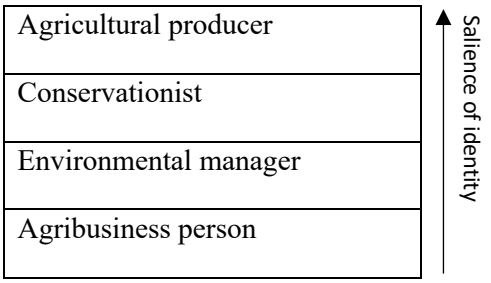
1. Family/corporate expectations of financial performance (productivist), combined with a recognition of the need for environmental performance (non-productivist) (Farm 4 and Farm 5);



2. Agricultural producer (productivist) and non-productivist actions when linked with clear financial benefits (Farm 2, Farm 10, Farm 12);



3. Agricultural producer (productivist) and conservationist (non-productivist) (Farm 1, Farm 3, Farm 6, Farm 7, Farm 8, Farm 9, Farm 11).



In contrast to the Burton & Wilson (2006) P/PP/MF model, a new identity of environmental manager has been introduced. Under the environmental manager identity, the importance of following good environmental management practices is recognised and the motivation to implement these practices is driven by productivist attitudes, with a focus on profit. In contrast, the conservationist identity is driven by non-productivist attitudes and farmers are driven by a desire to be good environmental stewards. These categories will be further elaborated on in the following sections and in the discussion chapter.

5.3.1 Family/corporate expectations of financial performance combined with a recognition of the need for environmental performance

Farm 4

Farm 4 is a multi-generational family farm and in the interview, I spoke to two of the family members that were in charge of managing and operating the farm. The focus of the farmers was primarily on profit and financial sustainability. While they did recognise the importance of environmental protection, the focus was more on market performance and other financial factors instead of environmental values.

> *"*Financial sustainability is primarily why we're in business. Hey, some of the environmental stuff is becoming a big part of that now and just in terms of regulatory stuff and market stuff so we've got to be at the mark. But first and foremost, it's financial."
>
> "Without the financial sustainability we're not going to be doing it."

Farm 4 is a large farm that is following a weak-moderate multifunctional pathway. They are improving environmental management practices by working towards the criteria required under the FEP to receive an A grade. However, they are also running an intensive system that is mainly focused on financial performance and they are also looking to further intensify and expand their farming system.

Farm 5

Farm 5 is a small-scale corporate farm, that would be classed as an agribusiness according to the Wilson (2008) multifunctional decision-making funnel, with 20 investors and so one of the main drivers for the farm is profitability. However, the farm is still concerned with environmental protection and although one of the main drivers for this is to comply with the environmental audit criteria, the farm is still classified as an agricultural producer.

> "So, the main objectives that we're working towards are profit. Obviously, you've got 20 investors and they all want a dividend, it's a very passive group of investors is how I would describe them."
>
> "With a bit more money in the pay-out now, we said let's just go and fence off a culvert crossing with a bit of water that floods up and down and we made a decision to just fence off that part of the stream and do riparian planting. We're just committed to being quite proactive about doing stuff that will look good on an environmental audit, without wanting to sound cynical about it, but they make a difference to the farm."

The farmer understands the importance of societal acceptance of agricultural practices and has responded by improving farm environment practices, such as reducing the stocking rate.

> "So, our license to farm and that type of stuff is clearly at risk, so we need to be doing the right thing from a societal perspective but it also kind of makes sense from a farming perspective as well to be doing good stuff."

> “We're progressively transitioning out of that now to having less cows on farm and more pasture.”

Farm 5 is following a moderate multifunctional pathway as, although the main driving factor is profitability, the farmer and investors have also recognised the importance of environmental protection. They are proactively adjusting their farm management practices and lowering the intensity of their farming practices through lowering the stocking rate.

5.3.2 Agricultural producer and conservationist actions when linked with clear financial benefits

Farm 2

Farm 2 is a corporate farm, that would be classed as an agribusiness, focused on financial performance and on production, so is classed as an agricultural producer. However, the motivation for profit does not override the need for environmental protection.

> “We'll get much better grass growth with that type of irrigation so the primary driver for development was to grow more grass. The benefit is that there is also a benefit for the environmental side.”

> “Around my view of the best practice, they mostly just make financial sense and farming sense anyway.”

> “[…] good management practices, as I said before they usually make financial sense as well so it's not that it comes as a cost it should be coming as a benefit to the farm.”

For this farmer, environmental protection through not putting too much pressure on the land in light of ecological constraints were important parts of being a good farmer.

> “We've just continued with focusing on where the hotspots for nutrient loss [are] and usually it ties in with financial benefit that we're having either the return from increased pasture growth, or reduced risk.”

This farm is following a moderately multifunctional pathway. Despite the fact there is a strong focus on profitability and financial security, the value of implementing good or best environmental management practices has been recognised. Most of the environmental best practice measures are also financially beneficial due to increased production and efficiency of resource use. As a result, the farmer is constantly working on improving the farm environment management practices.

Farm 10

Farm 10 is an owner-operator run large farm and the farmer is classed as an agricultural producer as productivity is the most important factor for farm performance.

> "It'd be production vs expenses for us really. Working costs is the biggest driving factor for us."

For Farm 10, in order to be considered a 'good farmer' you need to: "[…] look after your cows; you've got to look after your ground, your rivers, your water." This statement indicates that environmental stewardship is important to the farmer, particularly on issues related to water quality. The farmer also stated the following:

> "It is what it is, and you've got to be ahead of the game otherwise you're not going to have all that water to use, they're going to be taking it off you and stuff like that. You can't use a whole lot of fertilisers in certain areas, you can't stock too high, you can understand that. We want cleaner rivers like everyone else does."

> "We are slowly dropping our cow numbers back a bit but trying to hold the production the same. As you do, as you get better genetics and better stocks."

Farm 10 is following a moderate multifunctionality pathway as the farmer is decreasing the intensity of the farming practices and is also joining the Synlait Lead with Pride scheme which has further environmental regulations that will reduce the environmental footprint of the farming practices.

Farm 12

Farm 12 is a multi-generational lowland family farm and the farmer is classed as an agricultural producer because milk production is the most important factor for farm performance and if changes are going to be made to management practices, the farmer needs to have an economic motivation for making that change.

> "You've got to be able to produce stuff; if you can't produce stuff then you're not a good - well I wouldn't say you're not a good farmer, but I guess if you can't produce it, it's harder to make a buck."

> "We'll do it if there's going to be a production [benefit] - there's got to be an economic benefit to doing it."

For Farm 12, being environmentally aware is important, particularly in regard to nitrogen leaching.

> "You've also got to have an understanding of what's going on in the world around you, whether that's environmental, political or whatever; you can't just be so focused on what's happening on your farm that you don't know what else is going on and you've got to be able to adapt to that too if you need to."

> "How much N we use - we do keep an eye on it, that will fluctuate obviously depending on the year; how well we've used our water, we're fairly conscious of keeping an eye on our moisture meters and stuff like that to make sure we're using things at the right time."

Farm 12 is following a moderate multifunctional pathway as the farmer is operating a moderate intensity system but is keeping up with technological advancements to keep reducing the environmental footprint of the farm. Farm 12 is also part of the Synlait Lead with Pride scheme so is subject to an environmental auditing process from both Synlait and AIC.

5.3.3 Agricultural producer and conservationist

Farm 1

Farm 1 is a multi-generational lowland family farm and during the interview I spoke to two of the family members who are currently in charge making management decisions for the farm. The main identity for the farmers is as agricultural producers, as when they were asked how they determined if it had been a good year on farm, the main focus was on production:

> "I look a lot at it based on the amount of grass we are producing versus what we have to buy in."

These farmers also displayed conservationist tendencies as environmental stewardship, including concerns around biodiversity, was a key element for how these farmers operated.

> "You're a caretaker. I might have my name on the title, but I'm only a caretaker until the next generation. We do everything we can to do whatever we do efficiently and carefully and environmentally friendly, but we're only here in the short-step of time."

This farmer can be classed as following a moderate multifunctional pathway as there is a moderate intensity of farming practices in regards to the stocking rates and high importance is placed on improving farm environmental practices to preserve and enhance environmental quality.

Farm 3

Farm 3 is an owner-operator run lowland farm and the farmer can be classed as an agricultural producer as his focus is on milk production, but he also received an A grade under the audit scheme for environmental performance. In response to the question, “How do you judge if your farm is performing well?” the farmer commented: “Well the obvious one is milk solids gross.”

However, this farmer also values environmental protection, particularly in regards to water quality. He was part of the Pahau Enhancement Group and was very proactive with making changes to farm management practices when the effect of border dyke irrigation on the Pahau River was discovered.

Farm 3 is following a moderate multifunctional pathway as the farm system is at moderate intensity and the farmer is looking to do further developments, but there is a strong focus on preserving and enhancing the state of the environment.

Farm 6

Farm 6 is a multi-generational lowland family farm and in the interview, I spoke to two family members that are involved with the running of the farm. The farmers were classed as agricultural producers as the main focus is on production, but increasing profit does not dominate the decision-making processes on farm.

> “The biggest is production - what you grow to what you can harvest.”
>
> “Another big thing is that it's got to be economically viable, otherwise if the cost keeps going up and up it gets less and less.”

As a multi-generational family farm, environmental stewardship was highly valued as they want to pass the farm down to the next generation in good condition, so it can continue to provide for the family.

> “Probably the biggest [reason to implement environmental practices] is you've got to pass it on in as good or better condition as what you took it up in.”

Farm 6 is following a moderate multifunctional pathway as they are operating a moderate intensity farm, but a key motivational driver for these farmers is to improve the environmental performance to ensure environmental sustainability for the next generation.

Farm 7

Farm 7 is an owner-operator run lowland farm and the farmer is classified as an agricultural producer because profitability is one of the main drivers for the farm, but he is also socially and environmentally aware.

> "For us, profitability and people. If we've been profitable but burned a lot of people then that doesn't work, and you've got to, while it's not quantifiable as such, you try and know that you occupied the moral high ground when it comes to environmental."

Environmental stewardship is important for the farmer, who wants the farm to be in good condition for the next generation.

> "I mean I want to leave this farm better than I started with. I want our kids and our subsequent generations to be able to continue to farm if they want to. We want to just keep doing the right thing. As science improves and develops, then we will pick things up and we will follow."

> "While it's not the coolest thing in the world to only put 200 units of N on, it comes back to trying to do the right thing by the environment and the right thing by your business and you've just got to do it."

Farm 7 is following a moderate multifunctional pathway as they have a heavy focus on financial sustainability, but they are also implementing environmental measures and keeping up with new technology to keep up with or ahead of regulatory requirements.

Farm 8

Farm 8 is an owner-operator run lowland farm and the farmer is classified as an agricultural producer due to the importance of production and profit, however environmental protection is also important to the farmer.

> "A good year on farm, the main thing is obviously that you've earnt some money."

Water quality is important to the farmer, who was made a large number of changes to farm management practices to reduce the amount of nitrogen that is leached into the waterways.

> "So, we've done a lot of improvements and spent a lot of money on the layout on the farm, we've got a concrete feed pad and a huge storage pond for effluent... We're driving quite a bit to get that nitrogen leaching down, our figure is quite high, we winter milk which drives it up."

> "Water quality I do think is important, so we do have to do all these things."

Farm 8 is in the process of transitioning from a weak to moderate multifunctional pathway as the farmer is still operating a high intensity system, but is introducing new technologies and farm management practices to improve the environmental footprint of the farm.

Farm 9

Farm 9 is owned by three partners who have equal shares in the business and is classed as an agribusiness. The farmer is in charge of farm operations and the other two business partners oversee other aspects of operating the business. The farmer is classified as a conservationist due to the focus on environmental outcomes and lifestyle. Financial performance is still a critical factor for the farm, but the focus is getting the farm management practices working well and protecting and enhancing the quality of the environment.

> "Financial performance most years is pretty good, it takes care of itself if you take care of the other things so probably my major one is environmental and staff because the financial thing is mostly out of my control. If I'm running a reasonably sensible operation, the biggest difference to my performance is pay-out and I have no control over that."

The farmer is aware of his social responsibility to his employees, which is a driving factor to ensure the farm is performing in a sustainable manner.

> "I'm responsible for four people and their families and that so we need money to look after them and be sustainable, have quality of life somewhere that their kids can be and feel safe and have the lifestyle that they want."

Environmental concerns are a high priority for the farmer who is not interested in running a high input system. He is also concerned about protecting biodiversity on farm as well as spending money efficiently to get the best environmental outcome from on farm investments.

> "We've got no interest as a group in building concrete feed pads or sheds or a very high input system, and that's about me and where my skills and interests lies."

> "Unfortunately with putting pivots in and irrigation we had to take out a lot of trees so we're in a rebuilding phase with planting trees again in different places because with the border dyke we had a lot of planting and trees all over the farm but it is a terrible thing when you take anything out."

Farm 9 is following a moderate to strong multifunctional pathway as they are operating a moderate intensity farm, but are heavily focused on environmental protection and are also looking at potential options to diversify their income sources through means such as biogas production as mentioned in section 4.6.2.

Farm 11

Farm 11 is a multi-generational family farm, with a mix of lowland and upland farm, and the farmer is classed as an agricultural producer as productivity is one of the most important factors for determining how well the farm is performing.

> "I suppose it's just a combination of things between on farm performance like profitability and productivity."

Environmental stewardship is also important to the farmer and he is aiming to reduce the environmental footprint of the farm as much as possible within the bounds of remaining economically viable as a business.

> "We're below 3 cows per hectare which would be considered low, very low."

> "I guess making the place looks good, making sure our environmental footprint is mitigated as much as we can is becoming more important I suppose."

> "That's where I'd like to get to, to a point where people would drive around and think he's done a good job of planting and fencing and stuff like that."

Farm 11 is following a moderate-strong multifunctional pathway as the farm is not just specialised to dairy. The farmer stated that he has: “got the hill block across the road which has got about 290 hectares of irrigation which does all our young stock and also some sheep and beef, all the dairy support and sheep and beef and a little bit of trading.” The farmer is operating a low intensity system, it will be part of the Synlait Lead with Pride scheme and the farmer is driven to continuously improve the environmental management practices.

5.4 Impact of audit grade on sense of being a good farmer

There was a mixed response from farmers in response to the question about whether the audit grade they received impacted on their sense of being a good farmer. Farmers across all three types recognised the importance of the auditing process and for some the grade they received did have an impact on their sense of being a good farmer. One farmer stated: “Yeah I guess so. It would have been nice to get an A, well we obviously weren't doing everything right, but we were so close” (Farm 11). Similarly, another farmer stated: “No, oh well but yes, we've had our A grades but in the four years between the audits, we're still farming the way we should be farming. If we'd been audited each year we'd still get an A grade. For others, I think the likes of getting a D grade is a good wake-up call” (Farm 2).

Others didn’t agree with all the measures in the FEP audits and so the grade did not impact on how they saw themselves as a farmer, but did provide them with a good incentive to keep working on improving their farm management practices. There was no correlation between those that did and did not agree and the farmer type. One farmer stated: “I don't accept all their parameters and my perception of myself is more around I've got business partners who I need to satisfy and most of their demands are around cashflow but also they are Wellington businessmen and they want to be proud of what they do, they want to come here and it looks beautiful and the cows are healthy but also that the people are happy. We want to make money but in a way we all feel comfortable” (Farm 9). Another farmer stated: “it's only a part of being a good farmer, but it certainly has an effect on the way you feel about [it]” (Farm 6). David Croft (AIC Chairman) supported the notion of some of the farmers and did not feel that the grade impacted on their sense of being a good farmer. He stated: “I don't think that the grade you get would - to us it doesn't alter the challenge. Whether it's a B or an A, there's still that challenge there to improve or to think or evolve. Certainly, the grading keeps you motivated.”

5.5 Chapter summary

This chapter explored how farmer identity has changed in recent decades in the Hurunui-Waiau catchment. Some farming practices that were deemed acceptable a few decades ago are no longer appropriate in today's society, such as directly disposing effluent into waterways. Increased awareness of environmental issues and the change in farm management practices created a context where the understanding of how you need to farm to be considered a 'good farmer' has changed. This was reflected in farmer identity, with all farmers classified as multifunctional due to the inclusion of non-productivist thoughts and actions. The majority of farmers expressed their awareness of environmental impacts and the importance of conservationist values in how they operate their farms, and looked to mitigate these to varying degrees. This indicated that environmental stewardship was an important aspect of being a 'good farmer' for seven of the farmers that were interviewed.

Chapter 6

Discussion

6.1 Introduction

This chapter draws on the themes identified in Chapter 4 and Chapter 5 and relates them back to the contextual information and theoretical frameworks that were outlined in Chapter 2. Section 6.2 provides a summary of the positives and negatives of the change in management from ECAN to the AIC Environmental Collective. Section 6.3 summarises the changes in how farmers define the identity of a 'good farmer' as well as where different farmers sit on the spectrum of multifunctionality. Section 6.4 provides an overview of alternative strategies for improving the uptake of environmental practices and further reducing the environmental footprint of farming practices in the Hurunui-Waiau catchment.

6.2 Positives and negatives of AIC Environmental Collective management

The introduction of the Amuri Environmental Collective and Farm Environment Plans has seen a significant shift in the management of environmental policy within the catchment. With AIC taking responsibility for overseeing the implementation and management of the FEPs, farmers now have much less interaction with ECAN and are instead being managed by their peers. AIC is a powerful influencing body in the catchment and as they hold the water-take consent for their shareholders, they are strong advocates for representing and protecting the voice of the farming community, particularly on the Zone Committee. For most farmers in the catchment, the shift in management has created a sense of peer pressure to be performing well environmentally because the collective is run by local farmers who are based in the community. As a result, there is more community pressure to not let down other farmers who are part of the collective. This motivational driver has acted as a catalyst for changing farm management practices because the farming community is small and word travels quickly if you receive a C or D grade. The ability of AIC to switch off the water supply to farmers that receive three repeat C or D grades has also provided a strong incentive, with enormous financial and production implications, to improve environmental performance, particularly as ECAN never had the ability to deny access to water supply in the same way.

Farmers across all groups that were interviewed commented that there had been a significant increase in what was expected of them under AIC management and the auditing process was much stricter than what they were subject to under ECAN, particularly as the auditor had been a farmer

for a number of years and so had an expert understanding of farm processes and potential loopholes. The rigorous auditing process demanded a higher level of detail in documentation of farm inputs and outputs. However, there was some contradiction between the initial AIC auditing process and the proposed best practice for EMS which insists on the need for a fully independent auditor. This has since been resolved with independent ECAN-certified auditors appointed, but there could have been some influence on farmer behaviour in the initial audit rounds due to them being conducted by an auditor employed by AIC (the AIC Environmental Manager, Alastair Rutherford), rather than by an independent auditor. For some farmers, the initial auditing round required a significant change in management style, which some (particularly owner operators and family farms who had the most control over which multifunctional pathway to follow) found challenging to accept. Alastair Rutherford observed that some of the farmers who had initially received a low grade and were creating pushback had become some of the biggest advocates for the environmental collective after realising the value of the scheme and the need to change.

The auditing of FEPs has been a tool in changing the mind-set of farmers around what is deemed acceptable in terms of the environmental footprint of farming in the Hurunui-Waiau. Now that AIC are expecting their farmers to be operating at GMP (at minimum), there are more stringent environmental rules and regulations that are part of the farming norm and a lot of farmers recognise that this is necessary to maintain a public license to farm. All the border dyke irrigation in the catchment has been converted to spray irrigation and irrigation by-wash no longer flows directly into the waterways, which was the source of contamination for the Pahau River. Most farmers are also shifting towards fixed grid irrigation as it is a more efficient system, favoured by farmers because it provides a win-win situation of increasing production of grass while also reducing leaching rates. For the majority of the audit requirements, with the exception of effluent management, farmers have recognised that there is both an environmental and financial benefit to improving the efficiencies of their system. As a result, understanding of water quality issues is much higher in the catchment and the interviews suggest that, for the most part, farmers have accepted the need to continue to adapt to new requirements and expectations.

6.3 'Good farmer' concept: Multiple identities and the shift away from productivism

Statements made in the interviews about how farming practices had changed over the last few decades indicated that farmers' environmental awareness has gradually increased. Some of the farmers admitted that, when they were growing up, farming practices tended to be solely production driven and focused. It was the norm for effluent by-wash from border dyke irrigation

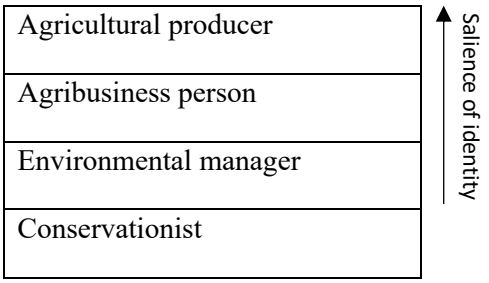
systems to be dumped directly into waterways and there were less stringent rules surrounding animal welfare. These practices, which would be punishable offences under current legislation, were not challenged by society as what was deemed acceptable was very different to the standards and expectations of today.

The initial trigger for change in the Hurunui-Waiau catchment was the state of the Pahau River in the 1990s following several years of pollution from irrigation by-wash flowing directly into the waterways. Witnessing the green balls of slime flowing along the river made farmers in the catchment realise that what they were doing upstream was having a direct impact on the health of the waterways. Regulators also realised that new plans and policies were needed to better manage water quality, which led to the formation of several committees (including the Hurunui-Waiau Zone Committee) under the CWMS collaborative governance initiative, to govern water issues across Canterbury watersheds. The Zone Committee has also played a critical role in raising awareness of environmental issues in the catchment.

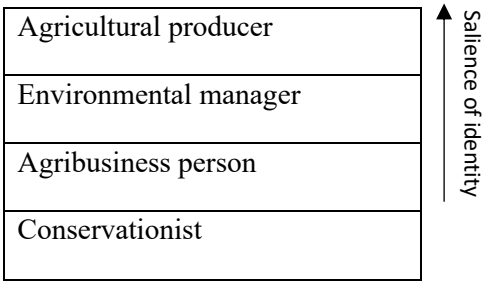
One of the key factors behind this mind-set shift has been an increase in understanding of the level of environmental impact that certain farming practices cause. The best example of this is border dyke irrigation, because at the time it was introduced it was considered the most advanced technology of the day and farmers were actively encouraged to adopt it into their farming systems. Once it became apparent that there were significant environmental impacts, farmers shifted away from it because it wasn't their intention to be polluting the rivers. They weren't aware of the damage the by-wash was causing to the waterways as they lacked information that linked the downstream outcome to their practices on farm. The establishment of the AIC Environmental Collective and the implementation of FEPs have contributed to a shift in the mind-set of farmers that gave higher priority to addressing environmental issues in the catchment. The FEPs now require thorough documentation of farm inputs and outputs and while some farmers were sceptical and reluctant at first, this research suggests that most farmers in the catchment accept the need for stricter regulations in order to maintain and enhance the health of the rivers as well as for the public license to continue farming.

Analysis of the semi-structured interviews showed that all of the interviewed farmers expressed multiple identities in the productivist to non-productivist dimension, supporting the claim that there is no uniformity of identity and farmers cannot be characterised by a singular, fixed identity type (Burton & Wilson, 2006). The interviewed farmers were broken into the following three groups in Chapter 5 according to influencing factors that determine environmental behaviours:

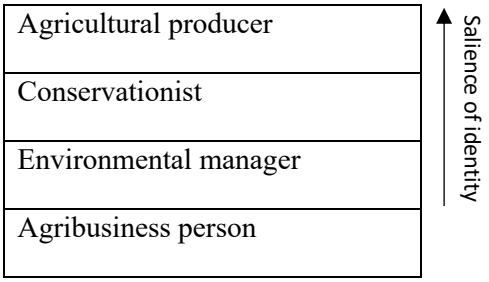
1. Family/corporate expectations of financial performance (productivist), combined with a recognition of the need for environmental performance (non-productivist) (Farm 4 and Farm 5);



2. Agricultural producer (productivist) and non-productivist actions when linked with clear financial benefits (Farm 2, Farm 10, Farm 12);



3. Agricultural producer (productivist) and conservationist (non-productivist) (Farm 1, Farm 3, Farm 6, Farm 7, Farm 8, Farm 9, Farm 11).



All three of the categories above are multifunctional approaches as there is an overlap in both productivist and non-productivist thoughts and actions. Whilst the agricultural producer identity is important across all groupings, the influencing factors for determining environmental behaviours are different. However, in terms of the spectrum of multifunctionality (Wilson, 2008) not all categories, nor all farmers within these categories, are operating at the same multifunctional pathway level.

In the first category, farm 4 is a family run farm and farm 5 is a mini-corporate. For farm 4, the family members that are involved in the running and managing of the farm are driven primarily by profit

and maintaining financial sustainability. They are complying with the FEP requirements because they need to in order to ensure AIC continues to supply them with water and they also need at least a B grade to be able to further develop their farming system. While they recognise that good environmental practices are becoming more important, for them it is within the context of public acceptance in the marketplace, instead of environmental stewardship being part of their core value set. Farm 5 is on a similar wavelength, with profit being the main driver as there are a number of investors in the farm who expect a good financial return. However, although the main focus is on profitability, farm 5 has recognised the need to act as a good corporate citizen and has done this by lowering the stocking rate and no longer wintering cows on-farm because they understand there needs to be public acceptance of farming practices in today's society.

Whilst both farms are mainly driven by profitability and financial sustainability, there is a noticeable difference in how these farms approach environmental performance. For farm 4, conservationist values are not part of the core value set of the family members, therefore the environmental manager identity has a higher salience than the conservationist identity. They are following a weak-moderate multifunctional pathway as they are improving environmental practices, but only to the extent required for compliance and they are looking to further intensify their farming system. In contrast, while farm 5 needs to meet the expectations of its investors and the environmental manager identity has a higher salience than the conservationist identity, they are following a moderate multifunctional pathway. They have lowered the intensity of their farming practices and increasing the amount of riparian planting, driven by the need for public acceptance. This supports the notion in the Wilson (2008) paper that it is possible for agribusinesses, to transition to stronger multifunctional pathways, but it depends on the ideologies of the agribusiness owner.

In the second category, farm 2 is a corporate farm, farm 10 is an owner-operated farm and farm 12 is a multi-generational family farm. These farmers primarily follow the value set of an agricultural producer, but they have also adopted non-productivist actions due to the financial benefits associated with improving aspects of environmental performance. The aspects of environmental performance on which these farms focus are those that improve production efficiency, such as switching to more efficient irrigation systems that increase grass production while simultaneously reducing leaching rates. Before a new farm environmental practice is introduced, there need to be clear financial benefits; otherwise it is less likely that these farmers would implement it. As a result, the environmental manager identity has a higher salience than the conservationist identity. All three of these farms are following a moderate multifunctional pathways as they are all moderate intensity farms in terms of farm inputs and stocking rates, with farm 10 slightly higher than the others but the

farmer is slowly lowering the stocking rates. All of the farmers understand the importance of water quality and the environmental impacts of dairy farming, but will only alter their systems when there is a financial incentive indicating that they are not in a transitional phase towards strong multifunctionality.

Most of the interviewed farmers fell into the final category, which is also characterised by an overlap between productivist and non-productivist identities; however non-productivist identities are more salient for these farmers than the others. For all farmers in this category, the agricultural producer identity is of critical importance for their definition of what it is to be a 'good farmer'. However, their role as an agricultural producer has also begun to incorporate non-productivist thoughts and actions that are associated with a conservationist identity. The level of non-productivist thought and action is not equally expressed amongst all farms in this category, but these farmers can be differentiated from the other two categories because environmental stewardship is driven by the core values of the farmers instead of being driven by financial incentives or regulatory requirements.

Farm 8 is at the lower end of the spectrum for the importance of the conservationist identity in the final group. Environmental issues are important to the farmer, who has made significant changes to the farming system to reduce the farm environmental footprint. However, the farm is still quite intensive with a high stocking rate and the farmer has been slow to uptake technology that is used to monitor inputs and outputs more accurately, so is following a weak to moderate multifunctional pathway. Farm 6 and Farm 7 are in the middle of the spectrum because they could be operating a higher intensity system, but they have chosen to restrict N inputs and have invested in new technology to improve monitoring of outputs, so are following a moderate multifunctional pathway. They want to ensure the long term sustainability of their land for the next generation and they want to be seen by the public as doing the right thing for the environment. Farm 1, Farm 3, Farm 9 and Farm 11 are towards the conservation-oriented end of the spectrum and the conservationist identity plays a big role in how these farmers operate. As a result they are following either moderate or moderate to strong multifunctional pathways. These farms are keeping up with new technological developments, are running low to moderate intensity farming systems, are focused on long-term environmental sustainability and are driven by the desire to be seen by the wider farming community and the general public as preserving and enhancing environmental values in the catchment. Farm 1 also valued the native biodiversity that they saw on-farm and Farm 9 was looking to diversify into bio-gas production as an alternative method for effluent management.

Due to the different motivational drivers for each of the three categories to adopt environmental practices, there is no clear-cut pathway for encouraging more environmentally friendly agricultural production. Instead, the findings of this study suggest that better promotion of environmental practice is dependent on the design of 'messaging' that targets the specific character of the three categories that have been identified. For the first two categories in particular, there needs to be clear financial or marketplace benefits of implementing an environmental practice on farm otherwise there is a low chance the practice will be adopted. These farmers have recognised that consumers are demanding sustainably and ethically produced food and that if they are to continue selling their produce in the long run, they need to meet the demands of consumers. Therefore, if society continues or intensifies its demands for sustainably and ethically produced food, these farmers could be expected to respond by improving their farm environmental practices. Furthermore, if regulators provide financial incentives for adopting certain environmental practices, there is a higher chance of these farmers implementing these practices. For the third category, conservationist values are part of the core value set for how the farmers operate and while they need to remain economically viable as a business, they do not require the same level of financial incentivisation as the other two categories. These farmers are more likely to weigh up the environmental, social and economic benefits of incorporating an environmental practice on farm. Regulators need to continue to support and encourage these farmers as they are more willing to adopt farm environment practices than the first two categories of farmers.

The findings of this study also suggest that industry-led regulation is more appropriate than regional council regulation for encouraging adoption of better farm environment practices. All farmers across the three categories preferred being managed by AIC to being managed by ECAN because the community was more involved and in charge of developing solutions to local environmental issues, particularly in regards to the health of the Hurunui and Waiau Rivers. As a result of farmers being more willing to engage in the conversation around resolving water quality and wider environmental issues, the catchment has seen a major improvement in farm environmental practices. Based on the findings of this study, it is likely that other catchments around the Canterbury region and other dairy regions in New Zealand would benefit from shifting to industry-led regulation if the same increase in farmer buy-in to improving farm environment practices took place and that it is managed within a collectively agreed broader system of limits.

6.4 Contribution to the literature

This study has contributed to the literature on the 'good farmer' concept, the P/PP/MF model and the spectrum of multifunctionality. In regards to the 'good farmer' concept, this study supports the

findings of Burton (2004) and McGuire et al. (2013) that farmers identify themselves first and foremost as food producers. The multifunctional self-conceptualisation was also a key factor in this study with almost all the farmers following multifunctional roles as it allowed them to include conservationist values and actions, while maintaining the importance of producing food and fibre.

Based on the findings of this study, it was not found that identities, such as conservationist or agricultural producer, direct farmers to narrow bands of behaviour. It can be argued that these identities can be better understood as idealised representations of behaviour and attitude that are incorporated within farmer practice. This study has demonstrated that environmental stewardship was an important aspect to the definition of what it is to be a 'good farmer' for most farmers that were interviewed. Even for those who did not hold conservationist values, environmental practices on farm had improved due to the recognition of the importance of public acceptance of farming practices and the regulatory need to remain compliant. This study also indicated that productivist and non-productivist rationalisations are tactically applied by farmers as they pursue objectives that are defined by other contextual factors such as the desire to be a 'good citizen', the desire for the next generation to continue farming and the pressure to meet investor demands for profit.

Only three of the four identities used in P/PP/MF model were identified in this study, with the diversifier identity not yet relevant to farmers in the catchment as they have not branched out to non-agricultural income streams such as tourism. This study also introduced the environmental manager identity to help differentiate between the self-conceptualisations in the three categories. The AIC Environmental Collective differs from the context of the Burton & Wilson (2006) paper due to the implementation of the EMS and auditing system. All farmers that were interviewed have made improvements to their farm environmental practices, however it was not possible to class them all under the conservationist identity for these practices as the motivations were not always around environmental and lifestyle concerns. The environmental manager identity is instead highlighting that for some farmers, environmental change was driven by productivist attitudes.

The salience of identity described in the Burton & Wilson (2006) P/PP/MF model fitted the productivist and post-productivist farmers. As noted above, for the multifunctional farmers the expected salience of the diversifier identity was not relevant, but the remaining identities were in the same order as the Burton & Wilson (2006) model. Farmers first and foremost still saw themselves as agricultural producers and then the environmental manager identity tended to be the most important. This study also supported the notion that post-productivism is not the next sequential step from productivism as all farmers that were interviewed were classified as

multifunctional. The transitions were also complex with many different motivational drivers for behavioural change as highlighted in Chapter 5 and 6.

In terms of the spectrum of multifunctionality, none of the farmers were following a strong multifunctional pathway so this study was not able to contribute to the claims of Wilson (2008) that the presence of a strongly multifunctional system also indicates that there has been a significant shift in the mind-set of farmers and other stakeholder groups from the traditional productivist approach that is solely focused on maximising food and fibre production. However, this study did find that some farmers who were following a moderate multifunctional pathway did not have conservationist values but were still performing well environmentally due to the recognition for the need for public acceptance and compliance. The impact of the auditing process on farmer identity can therefore be a distinct driver for adoption of multifunctional self-conceptions, which may provide a challenge to the statement made in the Wilson (2008) paper.

6.5 Alternative strategies for improving environmental performance

6.5.1 Synlait Lead with Pride

Several farmers in the AIC Environmental Collective are showing interest in the Synlait Lead with Pride scheme, with three of the farmers interviewed either already taking part or looking to join in the near future. The Synlait scheme is ISO 14001 certified, and the farmers that have signed up or are looking to sign up to the scheme value the ability to earn a higher premium for their milk. Interest in the scheme has grown because more farmers in the catchment are considering the benefits from the extra premium to be worth the effort of the extra compliance work, particularly as the expectation from the AIC FEPs are similar to that of the Synlait audits so the extra work required is not onerous. The Synlait scheme would be beneficial for the Hurunui-Waiau catchment as, with increased farmer participation, improvements in environmental performance on dairy farms could be expected to continue. Now that farmers under the AIC Environmental Collective are familiar with the AIC auditing system, the barrier to adopt other auditing practices may be less (a trend noted elsewhere in the New Zealand agricultural sector, see Rosin, 2008), particularly for the Synlait scheme as the requirements overlap and the overarching goals of the schemes are similar.

6.6 Chapter summary

This chapter outlined the key findings and discussion points from analysing the results chapters on the drivers of environmental attitudes and practices as well as farmer identity. The findings indicate that the shift from ECAN-driven regulation to AIC-driven regulation has been positively received by

the farming community and the peer pressure that has arisen since the shift has also been a driver for positive changes in farm environment practices. In terms of the shift in farmer identity, all three groupings are categorised as multifunctional self-conceptualisations due to the evidence of both productivist and non-productivist thoughts and actions being incorporated into farm management practices. While progress has been made to improve farm environmental performance in the Hurunui-Waiau catchment, opportunities are present for farmers to adopt new farm management practices based on research from the LUDF or to join additional schemes (such as the Synlait Lead with Pride scheme). These opportunities have the potential to further reduce the environmental footprint of farming in the catchment and reduce environmental pressures on the Hurunui and Waiau rivers.

Chapter 7

Conclusions and recommendations

7.1 Introduction

The purpose of this study was to identify the main drivers behind the shift in farm management practices towards GMP under the AIC Environmental Collective, and if there had also been a shift in how farmers define the identity of a good farmer alongside the change in management practices. This chapter is focused on the research questions that were laid out in Chapter 3 and summarises the key findings from the research. Based on the key findings, several recommendations are made with regard to environmental sustainability in the Hurunui-Waiau catchment. The final section of the chapter addresses the limitations of this study, the contribution to the wider body of literature and recommendations for future research.

7.2 Key findings

The key findings of this research are in response to the following research questions that were posed in Chapter 3.

7.2.1 Conclusions from research question one

> *Since the introduction of the AIC Environmental Collective has there been a shift in farmer attitudes and self-concepts that align with a shift in farmer identity towards non-productivism or multifunctionality? If yes, what have been the main drivers of this change in attitude and self-concept?*

In regard to the first question, the introduction of the AIC Environmental Collective has contributed to an overall shift in farmer identity since the introduction of the AIC Environmental Collective, with the inclusion of more non-productivist attitudes and actions. All farmers that were interviewed fell into the multifunctional category due to the use of both productivist and non-productivist attitudes and practices on farm, however farmers were at different stages along the multifunctional spectrum. Farmers that started at an A grade were already operating at GMP so the FEP audits did not require them to make any major changes to their farm management practices. Initial pushback from some farmers in the improving and static categories was caused by the need to change the farm management practices and the need for expensive capital investments such as increased effluent storage. This was harder for some to come to terms with as they had been operating their farm in a certain way for a long period of time. There were also some concerns around the financial practicality of some of the FEP requirements that caused tension between farmers and ECAN.

Following the second or third round of auditing, farmers who were originally resistant to or sceptical of the FEPs began to realise the value that complying with the audits had for the catchment. With increasing expectations for environmental performance from regulatory bodies and the general public, the farmers realised that in order to adapt and evolve to these changing expectations, the FEPs were an important step in maintaining a public license to continue farming. The importance of the FEPs is underlined by the farmer who stated, "*I know a lot of farmers—and even we were the same to start with—were thinking 'well what the hell is going on here' but if we hadn't [changed] then we'd be dead. We wouldn't be farming"*. After having this realisation, famers frequently referred to the realisation of the broader environmental benefits as a turning point in their decisions to improve their farm environmental practices and were motivated to improve their grades to reach an A.

7.2.2 Conclusions from research question two

> *If there has been a shift in farmer identity under the collective scheme, is there a difference in the shift in identity between farmers that started at an A grade, farmers that improved and static farmers?*

Whilst there has been a shift in farmer identity towards multifunctionality, there is not a distinct difference in the shift in identity between the three interview groups. The only group that shows a consistent similarity in farmer identity is the improver group, whereas the farmers that started at an A grade and the static farmers did not show consistency in farmer self-concept.

Started at an A grade (Farm 2, Farm 3, Farm 5)

The three farms that started at an A grade fell into different multifunctional identity categories, which indicates that a farmer does not have to hold conservationist values to demonstrate good environmental performance. The farmers that were interviewed identified regulatory incentives, financial incentives, public opinion and consumer incentives as providing motivation to follow GMP or best management practice. Therefore, the state of the environment is benefitting from proactive farm management practices even though conservationist values were not part of the core value set of two of the farmers that started at an A grade.

Improvers (Farm 1, Farm 7, Farm 8, Farm 9, Farm 10, Farm 11)

All of the improvers, with the exception of farm 10 (static), were part of the third category (Agricultural producer and conservationist). Farm 1 and Farm 11 were multi-generational family farms; Farm 7, Farm 8 and Farm 10 were owner-operated farms and Farm 9 was a multi-ownership farm. Irrespective of the differences in farm ownership structure, environmental stewardship was

highly important to these farmers and was part of their core value set. While environmental stewardship was an important factor to farmers in the other groups, for the improvers in particular it was a motivational driver for these farmers to improve their farm management practices and receive higher grades for their FEP audits.

Static (Farm 4, Farm 6, Farm 12)

The static farms also all fell into different multifunctional identities. Farm 6 and Farm 12 were almost at an A grade and were actively working towards reaching that goal, with Farm 6 being motivated more by environmental stewardship factors and Farm 12 motivated by financial benefits such as improved efficiencies. Farm 4 was also slowly working towards an A grade; but it was not a top priority as they only need a B grade to be able to further develop their farming system and conservationist values are not part of their core value set.

7.2.3 Conclusions from research question three

> *What has the overall effect of the AIC Environmental Collective been on the environmental sustainability of farming practices in the Hurunui-Waiau?*

Whilst there have been significant improvements in farm environmental performance since the establishment of the Amuri Environmental Collective, water quality and water usage are still highly contentious issues within the catchment. Despite the increase in environmental awareness within the farming community, serious concern has been raised by Fish & Game, Forest & Bird and some of the farmers that were interviewed around the present and future state of the Hurunui and Waiau Rivers. Some of the farmers expressed frustration that they have gone to extensive efforts to improve their water use efficiency and reduce leaching rates and instead of those improvements going back into the river, the headroom has been reinvested to allow further expansion and intensification of land in the catchment. Farm 8 in particular was concerned that all they had done was allow AIC to further expand its business instead of improving the health of the rivers. The Forest & Bird representative expressed serious concern around the impact that further intensification will have on river health. They stated that, to this point, only 56% of the consented water is being utilised by farmers and the Hurunui River is already classified as a polluted river with levels of phosphorus that exceed regulatory limits. If all of the consented water becomes utilised, further intensification continues and the proposed HWP goes ahead, the impacts on water quality in both rivers could be severe. There was also concern raised around dryland farmers, who are still waiting for someone to offer up 7 to 8 tonnes of nitrogen loading to allow them to farm as a permitted activity.

At present, the Zone Committee has two options for implementing the HWRRP minimum flow rates, with recommendations on each option due by December 2018 (Hurunui Waiau Zone Committee, 2018c). The first option is by consent review and the second option is to accept AIC's staged minimum flow and environmental enhancement package. Under the consent review option, for the HWRRP minimum flow rates to be implemented on these consents now, it will require ECAN to review water take consents in the catchment. This could take two to three years due to the ability of legal challenges to be taken under the RMA or for consent holders to agree on a voluntary basis to increase the minimum flow rate on their consent (Hurunui Waiau Zone Committee, 2018c). ECAN have stated that they would consider reviewing the water take consents in the catchment, but this would not take place until 2022/23 and it is highly likely that major consents holders will oppose the review and put forward a legal challenge, which will take up to three years to process and will be an expensive process (Hurunui Waiau Zone Committee, 2018c). The second option would be to adopt the proposed package from AIC, which would see the minimum flow rates implemented by 2026. There would be a similar timeframe for the implementation of the minimum flow rates as the consent review option (if the review did not take place until 2022/23) as it is highly likely that AIC would put forward a legal challenge; however it would be a more cost-efficient option for them to implement their proposed package (Hurunui Waiau Zone Committee, 2018a).

The second proposed deferment package from AIC has led both Fish & Game and Forest & Bird to withdraw from the Zone Committee. These environmental organisations are frustrated because the original deferment package offered a five-year grace period in which the improvements made in nutrient reductions were meant to be invested back into the river, but they were instead reinvested into the scheme allowing AIC to further expand their area. Therefore, Forest & Bird and Fish & Game object to further increasing the grace period given to AIC and instead are pushing for their consent to be renewed and the minimum flow rates to be implemented as soon as possible. As a result of the political tension, questions have been raised by Fish & Game, Forest & Bird and some of the interviewed farmers about the effectiveness of the Zone Committee procedures and decisions.

7.3 Recommendations

The AIC Environmental Collective has been successful at improving the farm environmental practices within the Hurunui-Waiau catchment and has also contributed to a shift in farmer identity and mind-set towards the environment. AIC needs to keep building on the momentum it has created within the farming community, to motivate farmers to continue adapting and evolving their farming practices to further reduce the environmental footprint of farming in the catchment and to aim for best management practice. If they manage to do this, the farmers under the collective scheme will

have a huge advantage when regulations around carbon emissions are introduced in the future as they will have a mind-set and attitude that is more conducive to accepting and adapting to the change. AIC have a unique opportunity to lead the way in the wider farming community by showcasing the positive work they have been doing with the FEPs.

Achieving sustainability in the catchment is a highly complex challenge that requires a balance between environment, society and economics. There is no quick fix or easy solution to this problem and it will require continued open collaboration through the zone committee processes, which needs to be accessible to all voices and opinions. In regard to the deferred minimum flow rate and the potential for further intensification in the catchment, there are environmental, social and financial issues within the catchment that need to be resolved, particularly in regards to the dryland farmers, as they are still waiting for an increase in their nutrient allowance so they can operate as a permitted activity and be in a more financially sustainable position. There is also wider interest from the general public, locally and nationally, in the health of the waterways. It is still unclear how this situation will play out in the future.

7.3.1 Research from LUDF

Research conducted by the LUDF successfully demonstrated that it is possible to reduce the stocking rate while maintaining productivity by better matching stock numbers with feed supply. Reducing the stocking rate reduces the number of urine patches on farm, which is one of the biggest contributors to nitrogen leaching. The change in practice did not require the construction of expensive barns (as has been done at the Ashley Dean Research Centre), so is a lower cost pathway for improving the on-farm environmental footprint. The farming practices that were used on the LUDF can be transferred to other farms around the country, so the Hurunui-Waiau catchment has the opportunity to further reduce its environmental footprint by adopting some new management practices according to the guidelines provided by the LUDF.

7.3.2 Subsidies to encourage adoption of new technology on farm

With technology continuing to advance at a rapid pace, new and innovative approaches for reducing the environmental impacts of farming practices are increasingly available. However, it can be difficult to find farmers who are willing to be early adopters of new technology due to the financial risk involved. Access to farmers who are willing to participate in field trials or to test practices or tools is an important part of the development stage. The initial phase of testing improvements in the innovation is crucial for ensuring the technology works in the field and the field test evidence is a key tool for demonstrating the effectiveness of the new technology to other farmers. Farmers are more

likely to adopt technology that has already been tested and trialed in the field, so there need to be incentives for farmers to trial new technology on farm. It was suggested by Ron Pellow and Scott Pearson that having a subsidy to provide a safety net for early adopting farmers in case their productivity and profitability drops would incentivize more farmers to try new and innovative technologies. This could be hugely beneficial in helping the farming community to continue evolving and adapting to constantly changing expectations for environmental performance and standards on farm.

7.4 Limitations and future research from this study

This is the first study to explore shifts in farmer identity and self-conceptualisations under the AIC Environmental Collective and will provide a base for further research in the catchment and elsewhere. In order to limit the researcher bias identified in section 3.8, stakeholders from environmental NGOs were interviewed as well as farmers to allow me to incorporate both sides of the story into the discussion and conclusions.

AIC has a total of 160 shareholders, however it was only possible to interview 17 farmers and stakeholders in this study and the farms that were interviewed were all dairy farms. Further research could investigate the differences in farmer identity and self-conceptualisation between different farm ownership types or farm types, particularly between dryland farmers and dairy farmers.

Appendix A

Research Information Sheet (for farmer interviewees)

Introduction and invitation
I would like to invite you to participate in a project entitled "Investigating the influence of the Amuri Environmental Collective on farming practice and identity in the Hurunui-Waiau region."

What is the aim of the project?
The aim of this project is to investigate why there has been a shift in farm practice following the introduction of the Amuri Environmental Collective scheme and if there has been an associated shift in farmer identity. This research project is for a Masters' thesis and will be funded by the Faculty of Environment, Society and Design.

What types of participants are being sought?
We are looking to select participants that represent the five main farm types that fall under the scheme (beef and sheep, dairy, dairy support, sheep, beef and arable/dairy support) as well as different audit grades. The participants will ideally be open to discussing how they operate their farm, their experiences with the AIC scheme and audit system as well as their opinion on the characteristics of a good farmer. An initial group of nine participants will be selected and will be asked to identify other farmers under the scheme they think will have differing opinions and would want to take part in the study. A total of 15 to 20 participants will be interviewed, with approximately 5 of these being stakeholders of the AIC scheme. Participation in this research is voluntary and there is no obligation to take part.

What will you be asked to do?
If you choose to participate in this study, you will be required to take part in an hour long interview at your residence. During the interview, you will be asked a range of questions on your experiences of the AIC scheme, how you manage your farm and your personal opinion on what dictates being a good farmer. Before the interview is conducted, you will be asked whether or not you consent to the interview being recorded digitally. You can also choose to abstain from answering certain questions or to completely withdraw from the interview at any stage during the interview process.

How will my data be used?
Once each interview has been completed, the recording from the iPhone will be transferred to a laptop and then a backup copy will be uploaded to OneDrive. Your identity will not be evident in the file name to ensure anonymity is preserved and access to the interview files will be password protected. My supervisors will also have access to the data to ensure the accuracy of the data analysis process. Following the backup process, the interviews will be transcribed into typed transcripts that will be made available to you.

When the data is sorted and analysed, your anonymity will be preserved by referring to you using a number (e.g. farmer 1), that will be randomly assigned. The names of related persons or of distinctive places will also be changed to avoid identifying you by association. The results of this research will be presented at the Lincoln University Postgraduate Conference in September.
If you later decide that you want to be withdraw completely from the study, or to withdraw an answer to a question this will be possible until the 16th of June.

What if I have any questions?

If you have any questions or concerns, please contact with me or one of my supervisors and we will make time to discuss any issues or complaints that may arise over the course of the study.

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This project has been reviewed and approved by the Lincoln University Human Ethics Committee.

Appendix B

Research Information Sheet (for stakeholder interviewees)

Introduction and invitation

I would like to invite you to participate in a project entitled "Investigating the influence of the Amuri Environmental Collective on farming practice and identity in the Hurunui-Waiau region."

What is the aim of the project?

The aim of this project is to investigate why there has been a shift in farm practice following the introduction of the Amuri Environmental Collective scheme and if there has been an associated shift in farmer identity. This research project is for a Masters thesis and will be funded by the Faculty of Environment, Society and Design.

What types of participants are being sought?

We are looking to select participants that represent the five main farm types that fall under the scheme (beef and sheep, dairy, dairy support, sheep, beef and arable/dairy support) as well as different audit grades. The participants will ideally be open to discussing how they operate their farm, their experiences with the AIC scheme and audit system as well as their opinion on the characteristics of a good farmer. An initial group of nine participants will be selected and will be asked to identify other farmers under the scheme they think will have differing opinions and would want to take part in the study. A total of 15 to 20 participants will be interviewed, with approximately 5 of these being stakeholders of the AIC scheme. Participation in this research is voluntary and there is no obligation to take part.

What will you be asked to do?

If you choose to participate in this study, you will be required to take part in an hour long interview at your residence. During the interview, you will be asked a range of questions on what your job entails, your experiences of the AIC scheme, your opinion on the best policy/ regulatory tools for improving farm environmental management and your personal opinion on what dictates being a good farmer. Before the interview is conducted, you will be asked whether or not you consent to the interview being recorded digitally. You can also choose to abstain from answering certain questions or to completely withdraw from the interview at any stage during the interview process.

How will my data be used?

Once each interview has been completed, the recording from the iPhone will be transferred to a laptop and then a backup copy will be uploaded to OneDrive. Your identity will not be evident in the file name to ensure anonymity is preserved and access to the interview files will be password protected. My supervisors will also have access to the data to ensure the accuracy of the data analysis process. Following the backup process, the interviews will be transcribed into typed transcripts that will be made available to you.

When the data is sorted and analysed, your anonymity will be preserved by referring to you using a number (e.g. farmer 1), that will be randomly assigned. The names of related persons or of distinctive places will also be changed to avoid identifying you by association. The results of this research will be presented at the Lincoln University Postgraduate Conference in September.
If you later decide that you want to be withdraw completely from the study, or to withdraw an answer to a question this will be possible until the 16th of June.

What if I have any questions?

If you have any questions or concerns, please get in contact with me or one of my supervisors and we will make time to discuss any potential issues or complaints that may arise over the course of the study.

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This project has been reviewed and approved by the Lincoln University Human Ethics Committee.

Appendix C

Consent Form (for farmer interviewees)

Name of Project: Investigating the influence of the Amuri Environmental Collective on farmer identity in the Hurunui-Waiau region.

I have read and understood the description of the above-named project. On this basis I agree to participate in the project, and I consent to publication of the results of the project with the understanding that anonymity will be preserved. I understand also that I may withdraw from the project, including withdrawal of any information I have provided, up to the 16th of June 2018.

☐ I consent to having an audio or video recording made of my interview.

☐ I do not consent to having an audio or video recording made of my interview, but agree to notes being made.

Name: _____

Signed: _____ Date: _____

Appendix D

Consent Form (for stakeholder interviewees)

Name of Project: Investigating the influence of the Amuri Environmental Collective on farmer identity in the Hurunui-Waiau region.

I have read and understood the description of the above-named project. On this basis I agree to participate in the project, and I consent to publication of the results of the project. I understand also that I may withdraw from the project, including withdrawal of any information I have provided, up to the 16th of June 2018.

- ☐ I consent to having an audio or video recording made of my interview.
- ☐ I do not consent to having an audio or video recording made of my interview, but agree to notes being made.

I am aware that, when published, the reporting of analysis results will quote from the information provided in the interview and it is common to identify speakers according to their position in the organisation or firm that they represent. If you do not select to have your anonymity preserved, quoted material can be checked for accuracy with you before it is published. I indicate below my preference with regard to whether my anonymity is to be preserved in such reporting:

- ☐ I wish to have my anonymity preserved
- ☐ I consent to not having my anonymity preserved

Name: _____

Signed: _____ Date: _____

Appendix E

Semi-structured interview questions

Questions to cover for the farmer:

1. Give a brief overview of the farming system you run.
    a. (With a farm map). Can you describe the main use/purpose of the different areas on your farm?
    b. How have you found using OVERSEER as a scenario-planning tool?
    c. What is the importance of irrigation to your system?
2. How do you judge if your farm is performing well?
3. Why did you decide to join the AIC collective?
    a. How do you compare being managed by an environmental management system under the collective scheme to being managed by ECAN? What are the advantages and disadvantages?
    b. What changes have you made to your farm management practices since joining the scheme?
    c. Describe the pros and cons of your experience with the auditing process.
    d. In complying with the audit, do you find that it constrains or aids the objectives and goals you have for your farm?
    e. If you were able to alter how the AIC scheme runs, what changes would you want to be made?
4. In your opinion, what do you need to do to be considered a 'good farmer'?

a. Do you think others (eg. other farmers, the general public, government) would define it the same way? If no, how do you think they would define it?

b. Does the grade you receive from AIC for environmental performance impact on your sense of being a good farmer?

5. How much do you think the change in national level policy regarding use of water will influence your farm management practices, particularly in regards to water quality?
6. What do you think needs to happen for farming practices to be environmentally sustainable in the Hurunui-Waiau region?
7. Do you have any other comments you wish to make?

Questions to cover for the stakeholders:

1. Briefly describe what your job involves and what your involvement with the AIC scheme has been.
2. What form of policy or regulation do you think is the best tool for promoting environmental best practice on farms?
3. How do you compare the AIC scheme with other environmental management systems?
4. What would you identify as the strengths and weaknesses of the AIC scheme?
5. What is your opinion on the use OVERSEER as a scenario-planning tool under the scheme?
6. If you were able to alter how the AIC scheme runs, what changes would you want to be made?
7. In your opinion, what do you need to do to be considered a 'good farmer' from the following perspectives:

a. Farmers
b. The wider community/ general public
c. Regulatory authorities?

8. How much do you think the change in national level policy regarding use of water will influence farm management practices in the Hurunui-Waiau area, particularly in regards to water quality?
9. What do you think needs to happen for farming practices to be environmentally sustainable in the Hurunui-Waiau region?
10. Do you have any other comments you wish to make?

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